RAILROAD GAZETTE

FRIDAY. JAN. 23.

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Contributions.

The Conservative East.

Beals Railway Brake Co.,
NEW YORK, Jan. 19, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the current number of the *National Car and Locomotive Builder* I am reminded that I got a scathing rebuke from Mr. Lauder for having made use of the words "conservative east" in my paper on "Driver Brakes," read before the New England Railroad Club in December last.

If I sinned in making use of such a remark, I find I did so in good company. The author of "Locomotive Engine Running and Management," in speaking of the introduction of the Westinghouse brake, says: "The railroads in the Eastern States, with a few creditable exceptions, were among the last to patronize it, and they adopted it only when the influence of public opinion could no longer be ignored. The terrible Revere accident, which happened near Boston, killing 29 and injuring 57 others, rudely shocked them into consciousness, and the railroad superintendents throughout the *conservative state of Massachusetts* then received enlightenment."—Pages 313 and 314.

Thus I barely escape plagiarism and must yield precedence in the conservative East idea to the author of "Locomotive Engine Running and Management."

JAS. HOWARD.

A Victim of Circumstances.

BOSTON, Jan. 19, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A victim of fate humbly craves the privilege of briefly intruding upon your valuable space by way of correction. When our old friend Job penned his immortal sarcasm, "Oh! that mine enemy had written a book!" the old gentleman was doubtless hankering after the sweet revenge of writing a scathing review, well foreseeing that an author who *rushes* into print, regardless of "proofs" and "revises," what with his own inevitable blunders—kindly assisted by those of the printer and the proof-reader—would be certain, sooner or later, to write himself down an ass.

In my article of last week, therefore (entitled "Lenses or Illuminated Semaphores," page 37), there were two errors—one (which I gladly saddle upon the printer), where it is said that a green light should awaken in the engineman's mind "weariness"—it was written *wariness*—"and vigilance"; and the other (which belongs to the author's side of the fence), where, through error in copying, "safety" is substituted for "caution"—bad copying and worse signaling, it is true—but the passage should have read, "If, however, a satisfactory *white* safety signal, conspicuous and distinctive, can be had, then green for *caution* and red for *danger* cannot be improved upon."

Thanks and farewell, Mr. Editor.

C. A. HAMMOND.

Creosoting Timber.

LONDON, Jan. 7, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In American Engineer's Notes upon timber creosoting [*Railroad Gazette*, Dec. 26, 1890] the question, What is creosote? is certainly easily answered by giving a definition of what creosote once was.

In the Engineer's Mental Dictionary of Technical Terms, the old meaning of creosote has no place in England. By creosote is now always understood the coal tar product, while the product of wood distillation is termed for distinction wood tar creosote.

The reply was, of course, not the one intended by the question which it only begs, but the question was put rather to lead up to the reply that creosote so-called is a compound body of very uncertain composition. Indeed, the same answer could only be given to the question of what is wood creosote, for this also is equally complex and changes according to the mode in which it was distilled. Of this, however, I have no special knowledge, but understand that wood oils have very valuable properties and are free from some of the defects of the coal oils being both non-poisonous and less caustic.

In only one case have I encountered the preserving of timber by wood distillates. This was at the works of an agricultural implement firm. The process was applied only to small stuff. The timber for use was cut up into its rough finished form, stock enough being only left for final finish. It was then stacked suitably into a brick chamber, and all the waste timber of the establishment was distilled over into this chamber, permeating more or less perfectly the thin timber. I was informed that the results were good, but of course the timber was not usually exposed to the severe conditions to which railroad ties are exposed.

Though wood creosote is supposed to be extracted from beechwood, no doubt the extract from southern pine will not be far different. There appears for English use one possible objection to the use of wood creosote for railroad ties, namely, its comparative scarcity and its consequent cost. Probably this is less marked in America.

Granted that coal tar is becoming scarcer in the United States, so also are pine forests. The coal will outlast the timber by present appearances, and it seems unlikely that even in America the wood product will displace the coal product.

Failing the success of the steel tie, we might yet see coal distilled purely for its creosote at a high temperature, coke and gas being mere bye products sold or consumed under the retorts according to price.

It may not be out of place to qualify the *advantage* of wood creosote in respect to its being non-poisonous to ourselves by the thought that it also is less hurtful even to low forms of fungoid life, and in this respect not so efficient as coal creosote. The difference of opinion as to the heavy and light oils is indication that further knowledge is necessary. It is significant that the Midland Railway, after a course of light oils, discontinued the process, but have gone on once more with a heavier oil.

As regards charring the outside of timber without danger, this is not surprising. Timber is not a good heat conductor, and a piece of timber may be well charred over its surface without seriously heating it internally.

Pelton's process, in an open tank, is not the process practiced here of injecting in vacuo. This makes all the difference between a certainty and a haphazard process.

THE WRITER OF THE ARTICLE.

Notes on the Abrasion and Endurance of Rails.

BY JAMES E. HOWARD.

I.

That diversity of opinions prevail concerning the physical properties deemed essential to secure rails of good wearing qualities, and those which will possess elements of safety against unexpected fracture, is very evident from the discussions which now and then appear. A review of some of the elementary features in the strength of metals, which are thought to influence their wearing qualities, may prove opportune without, however, be it confessed, bringing us much nearer the final solution of the problem. A correct solution involves the application of many practically and experimentally acquired data, and difficulties are augmented when the experiments are not sufficiently comprehensive, or when our knowledge of the exact conditions under which the metal works is inadequate, as frequently happens.

It is regarded as axiomatic in order that abrasion and wear may take place that the ultimate resistance of the metal must be overcome. The process of wearing away by mechanical means essentially demands that the particles removed shall be detached either by overcoming the tensile or the shearing resistance of the material. Compressive stresses may indirectly bring about abrasion.

Before discussing the effects of tensile and shearing stresses a few explanatory words will refer to material under compression. Experimental research has demonstrated that cubic compression, that is, in which the metal is exposed to compressive stresses in all directions, does not cause appreciable deterioration or change in physical properties. Various metals have been exposed to hydrostatic pressure in a closed cylinder in the Watertown arsenal experiments, and a pressure so high as 117,000 lbs. per square inch applied without changing their tensile or compressive resistances when they were afterward tested in the ordinary manner as free specimens. Inasmuch as the specimens experimented upon would not have endured anything like so high pressures applied in one direction only, without great distortion and with distortion their physical properties would have changed. We infer, therefore, that distortion is essential to produce a change in properties, and where stresses do not cause distortion, their magnitude or intensity is not of special importance. Of course our inferences stop with the maximum pressures yet employed, and refer to cubic compression under atmospheric temperatures. With these limitations it appears that the molecular arrangement of the metals is not disturbed by compressive stresses, as evinced by subsequent examination of the elastic properties and of their ultimate resistance.

A practical deduction from the principles just stated makes it appear a matter of indifference what the wheel pressures are, so long as the form of the rail is such as will support the part directly loaded and prevent that part from distortion or flow. This deduction, however, carries with it the further principle that the part loaded receives re-enforcement from a larger area of metal surrounding, and that such re-enforcement is experienced appears to be proven by direct experiment and common experience.

We will not pass to the consideration of pressure accompanied by elevated temperature, but merely remark, however, that a combination of pressure, flow and temperature seem favorable toward setting up the cohesive forces in metals which are welded at moderately high heats. At atmospheric temperatures our experiments have not reached pressures which either cause appreciation or deterioration in strength when unaccompanied by permanent flow. The compressive stress may be sufficient to cause overloading transversely, and some parts of the rail receive an excessive tensile stress as a result, or the metal may flow in a shearing direction away from the part directly loaded; but these are indirect results and do not affect the principle before stated, that compressive stress, as such, does not appear, within the range of our observations, to cause material change in the physical properties.

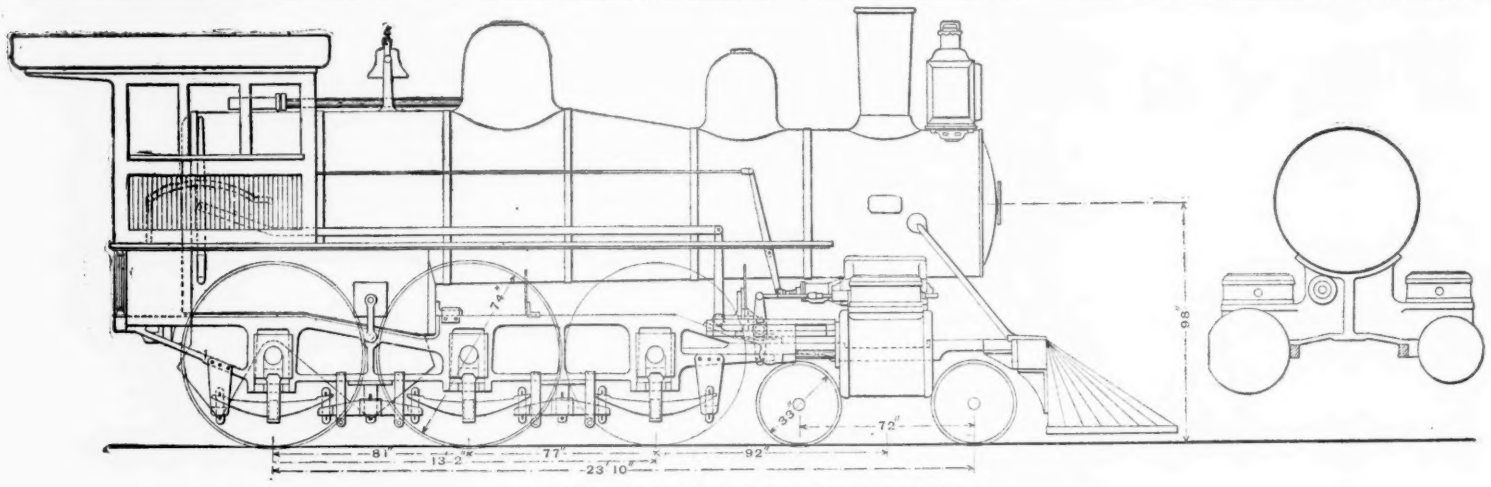
Considering the effect of tensile stresses in their relation to abrasion and wear, it appears that stresses within the elastic limit merely cause temporary strain or distortion, and that when the stresses are released the metal resumes its former shape and, therefore, no abrasion has been accomplished. Obviously if the elastic limit was sufficiently high the metal would simply be worked within its elastic properties, yielding under the loads as they were applied and recovering again, and this process might be repeated a large number of times, indefinitely it may be under some limits of stresses. Hence, from one point of view, an exceptionally hard metal would have the preference. Loads have been repeated millions of times with experimental bars and no deteriorating effects experienced. In such experiments the loads were confined well within the elastic limit of the metal.

We must note this difference, however, between the test of a bar under repeated loads and the ordinary case of abrasive action. In the former instance the strains are transmitted as we suppose from particle to particle in substantially the same manner at each loading, the finest fitted joints bearing no comparison to the accuracy with which the adjacent parts of the solid metal act upon each other. In the latter instance new parts are constantly being brought together which at best, in a strict sense, are ill fitted, and local stresses of great intensity are the result, minute parts of the surface are distorted, foreign substances are interposed, and the difference in pressure on adjacent parts may allow of local distortion exceeding the elastic displacement of which the metal is capable, in all of which kind of action we note a difference between abrasive action and metal ordinarily exposed to repeated stresses. There is very little probability of rail metal having so high an elastic limit or that the wheel pressures will be so low in terms of the elastic limit that local stresses or the differences in local stresses shall not cause distortion exceeding the limits of elastic displacement, and that wear, therefore, may be expected, however hard the metal may be.

But with stresses exceeding the elastic limit, it does not necessarily mean that abrasion and wear will at once takes place. We know that in a tensile test a large amount of mechanical work must be done in straining the metal from the elastic limit to its ultimate tensile resistance, which is true of all except the most brittle material. And in wire drawing, where annealing from time to time partially restores the metal to its former state, the material undergoes great change in form without rupture.

Generally speaking, mild steels require more mechanical work than hard steels in producing rupture resulting from the limited amount of ductility commonly displayed by the hard metal. The benefits to be derived from the greater amount of mechanical work required to produce rupture in the one case of mild steel over the steel of higher tensile strength in the other would seem to depend upon the magnitude of the straining forces which the metal is called upon to resist. That is to say, the apparent benefits of a tough, ductile metal might in a measure be offset by the facility with which the metal yields under comparatively low loads, and we should, therefore, infer that one grade of metal would not be equally suitable for all kinds of traffic, that rails which gave excellent results in one class of service would not necessarily be found equally suitable under other conditions. Were it possible to obtain a metal of high tensile strength, and which possessed the same degree of ductility as the mild steels, that metal would promise to be well adapted for various kinds of traffic.

The metal must be considered from another point of view, namely, as regards the effects of alternate stresses. In the tensile tests we have considered its behavior when subjected to stresses which caused flow in one direction and noted the amount of ductility displayed under these circumstances. The metal in the head of a rail superficially taken is subject to alternate tresses, and furthermore, as the rail as a whole does not sensibly elongate, it is a question of how much distortion may take place and be repeated within certain narrow limits



TEN-WHEEL COMPOUND PASSENGER LOCOMOTIVE.

By the SCHENECTADY LOCOMOTIVE WORKS *for the* MICHIGAN CENTRAL RAILROAD.

of total movement. Where one part is crowded along over another this relative movement introduces shearing strains. The phenomena which precede rupture under these circumstances are complex and are not yet fully understood.

Elaborate experiments have been conducted and are still in progress at the Watertown arsenal investigating the phenomena which precede rupture and defining of what deterioration consists. The importance of this class of information is highly appreciated and results of exceeding value will no doubt follow these investigations. From what is already known concerning the effects of alternate strains, it appears that rupture may eventually be produced by stresses which do not greatly exceed the elastic limit. The very nature of the problem does not admit of proving that any stress, however small, will not ultimately end in rupture, because however great the number of loadings we cannot be certain that the next application would not cause rupture. But judging from instances in which a great number of repetitions have been made, amounting to millions of loadings, and no premonitory symptoms shown, we infer that metals are practically indestructible if the loads are restricted to certain limits and believe that the elastic limit is a function of the limiting stress beyond which rupture will eventually ensue if repeated a sufficient number of times.

We are aware that it has been claimed that the elastic limit does not bear a definite relation to the stress which may be practically indefinitely repeated, yet it does not seem that the tests on which this statement was based were scrutinized sufficiently in matters of detail to warrant that deduction.

There is no doubt, however, upon this point that bars were fractured under repeated alternate stresses with very much lower loads than are required to produce rupture if only once applied. As the ordinary effect of mechanical work on the metal, whether performed when the metal is hot or cold, is to increase the tensile strength, just why repeated stresses in alternate directions should cause rupture under diminished loads has thus far eluded satisfactory explanation. Some phenomena which precede rupture have been identified, as for instance in tensile tests of ductile metal a reduction in the modulus of elasticity follows overstraining, although rest enables the metal to recover in this respect, and again changes in density have been shown to accompany overstraining. We can conceive that changes in density might introduce internal strains and the introduced strains augment external stresses in their effects, and bring about a state of affairs in which the particles are really ruptured locally under stresses much greater than the average stress acting on the metal as a whole. That is to say, that the cumulative effect of overstraining might end in rupture, having been accomplished in detail within the metal itself. Furthermore, the influence of chemical composition may exert an accelerating or retarding effect upon the facility with which rupture may be reached under repeated stresses. If such were proven to be the case, there would be ample justification for specifying the chemical composition of steel rails as well as their physical properties.

Superficially, alternate strains in opposite directions are received by the head of the rail in this manner, the tendency of the locomotive drivers when the train is in motion will be to crowd the metal in the opposite direction from that in which the train is moving, while all other wheels will from their reaction tend to crowd the metal in a forward direction. In the aggregate, action and reaction must of course be the same, but the greater weight upon the drivers will intensify the abrasive effect, and more wear would be directly attributable to them than the other wheels. In the case of a single track road the relative abrasion of a given tonnage might be somewhat greater than the same aggregate tonnage passing over its rails in one direction. A better opportunity of judging of the effect of such reversal in direction of loads is found in the tire metal of switching or yard engines, and it has been remarked by some careful observers that greater wear was shown by this class of engines than with those which ran chiefly in one direction. When brakes are applied to ordinary cars, then their wheels have the usual effect increased, while brakes to drivers would reverse the direction of their ordinary effect and cause them to crowd the metal at the surface of the head along in the same direction the train is traveling, as would be the case with the other wheels of the train. The varying shape of the treads of the several wheels in the train will tend to give a different direction laterally to the surface metal of the rail head as they successively reach the same place, and thus accelerate abrasion chiefly or in part in shearing directions.

(To be continued.)

Ten-Wheel Compound Passenger Locomotive.

The engine shown is one of the most important that we have described for some time. It is a heavy express compound locomotive for the Michigan Central Railroad, built by the Schenectady Locomotive Works. This engine is the second built for that road by this company, and it differs from the first engine in some very important particulars. The first engine was one of the best compounds yet brought out. It was given in considerable detail in the *Railroad Gazette* of Jan. 31, 1890, page 32. The first engine served as an example to teach of the value of compounding and the best form and type of locomotive cylinders for double expansion. As the result of experience gained with the first engine the second engine has been brought out.

The side elevation shows the general construction, and the table of dimensions describes somewhat the details. Placed opposite the dimensions of the second engine, in parentheses, will be found the dimensions of the first engine in cases where there is a material difference.

A reading of the description of the first engine, given in the *Railroad Gazette*, as above stated, will give a pretty correct idea of the one given here. Both engines are of the two-cylinder compound type, the steam being first used in the left-hand cylinder, which is 20 in. in diameter, and then exhausted through a receiver, which is placed in the smoke box, into the right-hand cylinder, which is 29 in. in diameter. An ingenious intercepting valve devised by Mr. Pitkin, Superintendent of the Schenectady Locomotive Works, is used in both engines to assist the locomotive in starting when the cranks are in a position to give but the minimum starting power. Further remarks regarding this engine will be found in the editorial column.

General Dimensions.

Fuel, bituminous coal.
Gauge of road, 4 ft. 8½ in.
Total weight of locomotive in working order, 135,000 lbs. (126,800 lbs.)
Total weight on drivers, 99,000 lbs. (97,000 lbs.)
Total wheel base, 23 ft. 10 in. (22 ft. 6 in.)
Driving wheel base, 13 ft. 2 in. (12 ft. 3 in.)
Rigid wheel base, 6 ft. 9 in. (6 ft. 3 in.)

Cylinders and Valves.

Diameter of high pressure cylinder, 20 in.
Stroke of high pressure cylinder, 24 in.
Diameter of low pressure cylinder, 29 in.
Stroke of low pressure cylinder, 24 in.
Piston of low pressure cylinder, cast steel, rings sprung in.
Kind of piston rod packing, U. S. metallic.
Diameter of piston rods, 3½ in.
Size of steam ports in high pressure cylinder, 2⅛ in. × 18 in.
Exhaust ports in high pressure cylinder, 3 in. × 18 in.
Bridge in high pressure cylinder, 1¾ in.
Size steam ports in low pressure cylinder, 2⅛ in. × 20 in.
Exhaust ports in low pressure cylinder, 3 in. × 20 in.
Bridge in low pressure cylinder, 1¾ in.
Greatest travel of slide valves, both, 6½ in.
Outside lap of slide valves, both, 1⅛ in.
Inside clearance of high pressure valve, ⅛ in.
Inside clearance of low pressure valve, $\frac{3}{16}$ in.
Kind of slide valve, Allen-Richardson patent balanced.
Kind of valve stem packing, U. S. Metallic.

Wheels, etc.

Diameter of wheels outside of tire, 74 in. (68 in.).
Diameter and length of driving axle journal, 7½ in. × 9 in.
Style of driving box, solid phosphor bronze with springs hung underneath.
Diameter of truck wheels, 33 in. (30 in.).
Diameter and length of truck axle journals, 5½ in. × 9 in.
Diameter and length of main crank pin journals, 5½ in. × 5⅛ in.
Diameter and length of intermediate crank pin journals, 5¾ in. × 5 in.
Diameter and length of front and back crank pin journals, 4 in. × 3⅜ in.

Boiler.

Working pressure, 180 lbs.
Style of boiler, extended wagon top (plain wagon top).
Support of crown sheet, radial stays (crown bars).
Diameter of first ring outside, 58 in.
Material and thickness of plate in waist and outside of fire box, spang steel, $\frac{7}{16}$ in. and ⅝ in.
Horizontal seams, quadruple riveted, with welt strip inside.
Circumferential seams, double riveted
Size of fire box inside, length, 96$\frac{7}{16}$ in.; width, 42¼ in.; depth, front, 67¾ in., back, 58¾ in.
Material and thickness of plates inside of fire box, spang steel: crown and side, ⅜ in.; tube, ½ in.; back sheet, $\frac{7}{16}$ in.
Water space around fire box, front, 4 in.; sides and back, 3 in.
Material of tubes, charcoal iron.
Diameter of tubes, 2 in
Number of tubes, 27 (247).
Length of tubes, 13 ft. (12 ft.)
Heating surface in tubes, 1,839.58 sq. ft. (not given before).
Heating surface in fire box, 141.2 sq. ft. (not given before).
Heating surface in fire-brick tubes, 11.8 sq. ft. (not given before).
Total heating surface, 1,992.58 sq. ft. (1,670 sq. ft.)
Grate surface, 28.2 sq. ft
Style of grate, rocking bars and drop plate.
Style of ash pan, hopper, with dump plates worked from cab.
Exhaust nozzle, single, 5½ in. diameter.
Throttle, balanced valve in dome.
Dry pipe diameter, 6½ in. inside.
Inside diameter of stack, 16 in.
Boiler supplied by two monitor injectors, right and left.
Style of engine truck, four-wheeled, rigid centre.
Make of engine truck wheels, Krupp steel tired spoke, held with retaining rings.

Tender.

Weight of tender, empty, 31,000 lbs.
Number of wheels, 8.
Diameter of wheels, 33 in.
Diameter and length of journals, 4¼ in. × 7½ in
Total wheel base of tender, 15 ft. ½ in.
Style of tender frame, S. L. W. standard, 6½ in. × 4 in. × ¾ in. angle iron.
Style of trucks, S. L. W. standard, 4-wheeled channel iron bolster, centre bearing front and back, with additional side bearings on back truck.
Water capacity, 3,800 gallons.
Coal capacity, 8 tons.
Total wheel base of engine and tender, 48 ft. 4⅜ in. (48 ft.)
Total length of engine and tender, 59 ft. 5⅝ in.

Car Service.*

BY W. G. WATTSON, DIVISION SUPERINTENDENT WEST SHORE RAILROAD.

After reading an invitation from your Secretary to present a paper at this meeting on the subject of car service, my first impulse was to promptly decline, as the question did not appear to be an appropriate one to bring forward for discussion by the members of a club such as this. But, after revolving the matter in my mind and reviewing it in all points, I changed front completely, and am here this afternoon fully persuaded that no better subject could be found for the reorganized New York Railroad Club to handle than car service. My reasons for so thinking are as follows:

The New York Railroad Club has been reconstructed, and from debating questions relating only to car construction and repairs, it has branched out to the discussion of all live questions affecting the technical operation of the steam railroad. Under live questions in the railroad world, "Car Service Reform" is entitled to and generally conceded a place of the first importance. The reason for this is that the adoption of improved methods in supplying and handling car equipment is not only a prime necessity, but a reform in this quarter promises a larger saving in operating expenses than is thought possible in any other branch of the railroad service.

It is not strange, therefore, that during the past five years we have seen the Trunk Line Commissioner (by special request of the Presidents), the General Time Convention, the American Society of Railroad Superintendents, and many prominent railroad managers in the West all giving special attention to the matter of car service, and trying to arrive at some satisfactory basis of operation that will insure better results. But, notwithstanding all this effort, the condition of the service is about the same as five years ago—the average car performance is less, and the private car question more complicated. There are many diverse interests, and no plan yet presented for bringing about an improved service has met with favor sufficient to secure the required co-operation of the different railroad companies.

THE SITUATION.

The situation is this: We have over 1,000,000 freight

*Read before the New York Railroad Club at the regular meeting Jan. 15, 1891.

cars in service, and the average performance is from 17 to 25 miles per day. In other words, these cars are in motion, on an average, less than two hours of each day. Cars should average at the very least 40 miles per day. Were this average secured, 500,000, or one-half the present number of cars, would be sufficient to meet the demands of transportation. On this basis the cost of the surplus cars, side tracks, motive power, etc., represents a needless but permanent investment of over $290,000,000 and an additional yearly expenditure of $23,000,000, without including interest on the money. From this you will see that the question of car service involves an interest of vast magnitude.

I will review, for your information, the line of action during the past five years: The Car Accountants' Association was first to call attention to the evils of the present car service system, and have ably championed the question of reform, making suggestions to various railroad societies, with a view to prompting discussion of the question and securing thereby an improvement in and healthier condition of the service. In 1885 Mr. Albert Fink, then the Trunk Line Commissioner, undertook to introduce what is known as the "combined mileage and per diem system," *i. e.*, that the rates of compensation for the use of cars paid by one company to another should be ½ cent for every mile run, and 15 cents per day for every day detained, instead of the present charge of three-quarters of a cent per mile run. The per diem charge was to act as an incentive to protect cars from unnecessary delay on side tracks. Mr. Fink entered into the work energetically, collected many valuable statistics, corresponded freely with railroad officials throughout the country, and the movement was fast reaching the point where there would have been sufficient co-operation on the part of the different railroads for the introduction of the improved system under such conditions as to assure success. But about this time two of the trunk lines suddenly announced that they had agreed to settle for the service of cars interchanged between them on the mileage and per diem basis (Mr. Fink's plan), and expressed a willingness to adopt the same form of settlement with all other companies desiring to adopt the same practice. At this point Mr. Fink withdrew and apparently gave the matter no further attention. During the three months following other companies gradually came into the scheme until there was a total of 41 companies. Then they began to drop out by reason of the increased amount they had to pay for car service, caused by the lack of general co-operation, and after six months' trial the system was discontinued. It is quite clear that it failed of success because it was inaugurated before the co-operation of sufficient companies was obtained to fairly test its merits.

The General Time Convention then took up the subject, and have for three years been trying to again start the mileage and per diem system. They were in a fair way to succeed two years ago but for the birth of the Car Service Association idea in the West, which sprung up suddenly and promised great results. You are all familiar with the Car Service Association plan which provides for the collection of demurrage charges from consignees and shippers when cars are held beyond a specified limit. About 25 of these associations have been in operation during the past year, but statistics recently collected by the General Time Convention indicate that no improvement in the average car movement has resulted. This is due principally to the fact that new cars are being built faster than new tonnage is developed.

The American Society of Railroad Superintendents has just taken up the question. Their line of action has in view the improvement of the service through the development of better methods for the handling of cars under the present mileage system. Undoubtedly much good can be accomplished in this direction, as the service on the majority of railroads is still in a very crude state.

If all three of these plans—per diem, demurrage and systematic method—were crowned with success the service would be improved, but, in my opinion still unsatisfactory, owing to the certainty of the large empty movement that would follow the application of such principles under the plans proposed. Yet the cardinal features of any car service system must be per diem and demurrage charges, and a systematic method in conducting the service. It may be left for the New York Railroad Club to develop the acceptable plan. Certainly no other achievement could bring the club greater recognition and honor. The opportunity now appears and the way to grasp it is to first discuss the question in all its phases.

A SUGGESTION.

To give you a starting point, I invite your consideration of the following proposition:

This is the critical period in the financial history of our railroads. The imperative need of the hour is homogeneous and economical management. An enormous saving would accrue were the cars owned by the railroads comprised in large geographical districts consolidated into an equipment company or trust, the stock of which shall be held exclusively and in perpetuity by railroad corporations within the territory prescribed; the allotment of stock to be on the basis of the average number of tons of freight handled per mile of railroad operated; subscriptions to the stock to be paid by the assignment of all freight car equipment owned by the railroad at time of subscription used in traffic service, to the equipment company, at the valuation assessed by boards of arbitration, composed of master car builders, the assessed valuation of each car to be based on its age, capacity, present condition, and cost. In case the assessed valuation of the equipment of a railroad does not meet the value of the stock allotted, it shall have the privilege of making good the deficiency by a cash payment, or to accept a less amount of stock than it is entitled to receive. In case the assessed valuation of the equipment of a railroad should exceed the value of the stock allotted, it shall have the privilege to some extent of taking up any stock that may not have been taken up by other railroads; otherwise the equipment company will pay in cash for such overplus of cars (valuation). A reapportionment of the stock of the equipment company to be made every two years on the original basis of tonnage per mile, at which time any railroad found to be holding more than its proportion of the stock shall be under obligation to sell such overplus of stock on demand at par value to the equipment company for transfer to companies not having their complement. The equipment company to have full control of the distribution of the cars between the different railroads, to make all repairs and to supply new equipment when needed. The revenue of the equipment company to be derived through the collection from each railroad of a uniform per diem charge for the cars used. The profits of the equipment company to be disbursed in the shape of dividend payments to holders of the capital stock. The affairs of the equipment company to be in charge of a board of directors consisting of representatives of the various railroads in interest, which representatives shall elect as general officers a president, first vice-president (in charge of finances), second vice president (in charge of construction and maintenance), and general manager (in charge of distribution). None of the general officers to be interested in any way, directly or indirectly, in the financial matters of any railroad holding stock of the equipment company.

The plan expressly contemplates the collection of demurrage charges from consignees, and per diem charges from the different railroad companies for use of cars. The details of operation have been carefully considered. They are of easy application, would in practice equitably subserve the interests of the various railroads interested and reduce the empty car movement to the minimum.

[The discussion on this paper is held for revision.—EDITOR.]

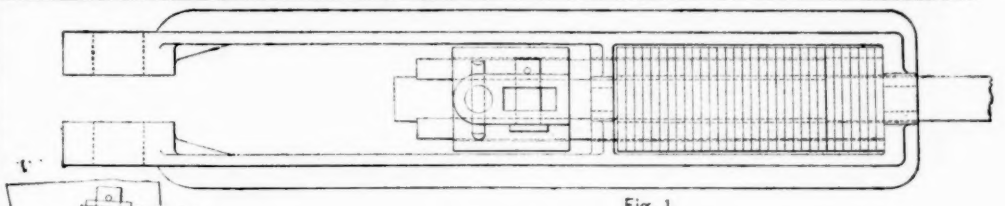


Fig. 1.

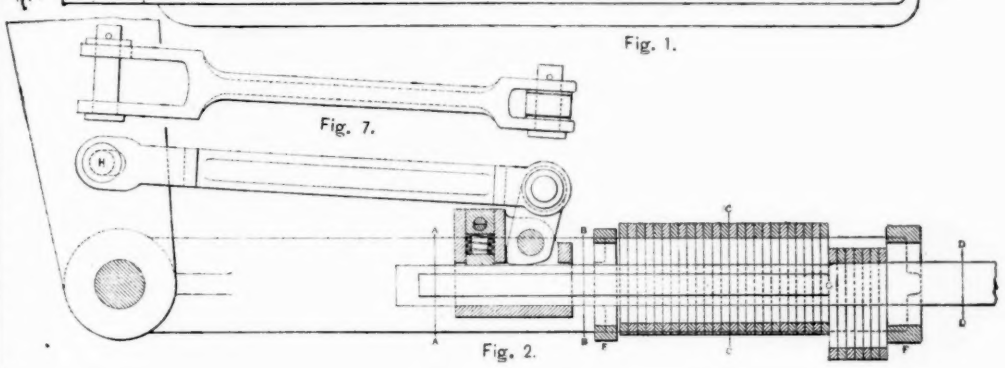


Fig. 7.

Fig. 2.

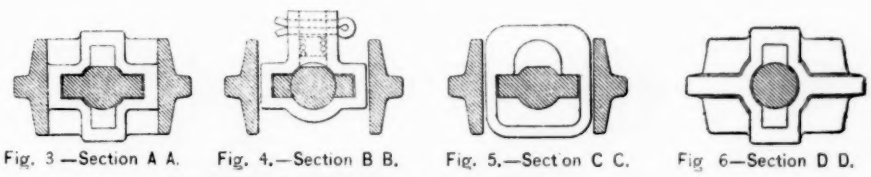


Fig. 3.—Section A A. Fig. 4.—Section B B. Fig. 5.—Section C C. Fig. 6—Section D D.

AUTOMATIC BRAKE SHOE WEAR ADJUSTOR.

Automatic Brake Shoe Wear Adjustor.

The accompanying drawing exhibits a self-adjusting apparatus for taking up the slack of brake gear upon railroad cars as fast as it takes place through the wear of the brake shoes. The drawings show it as it will be manufactured and sold ready to attach.

To the left in fig. 2 is shown a portion of a truck brake lever of modern proportions. This lever is in no respects different from those now in use, except that there is an additional hole *H* in it, through which a pin passes to secure the malleable iron connection shown in side view in fig. 2, and in plan in fig. 7. The main portion of the device is the malleable iron stirrup, shown in figs. 1 and 2, and in section in figs. 3, 4 and 5, an end view being shown at fig. 6. This stirrup is secured by the ordinary pin at the lower end of the live brake lever. Through the other end of the stirrup passes a rod which is an extension of the lower connection of the brake gear, so that the stirrup merely takes the place of the ordinary clevis on the connection at the live truck lever end. This end of the connection which lies in the stirrup is forged with a gib upon each side (as shown in cross section in figs. 3, 4 and 5), which gibs hold up in place a considerable number of peculiarly shaped iron washers, shown in fig. 5. These washers are confined in a pocket, formed by the two partitions *E* and *F* of the stirrup All the washers are shown in fig. 2 as being held up by the gibs, except the seven at the right, which have fallen, because the gibs and rod have been moved far enough to the left in the stirrup, to allow them to fall. To the left of the partition *E* of fig. 2 a friction clutch is shown upon the gibbed portion of the rod, and pinned to this clutch is the malleable iron connection of figs. 2 and 7.

The operation of the device is as follows:

When the brakes are applied, the lower end of the live brake lever moves to the left, in a circular arc about the brake jaw pin (not shown). This movement causes a pull on the stirrup at the live lever pin. This pull is delivered by the partition *F* to the washers between it and the ends of the gibs at *G*, through which the pull is carried to the clevis and dead lever at the other end. When the brakes are released, the lower end of the live truck lever moves back toward the right, the smaller pin at *H* also moving to the right, but with a smaller radius and, consequently, a shorter distance. Thus the clutch is tightened upon the rod, preventing its going with the stirrup, and the stirrup is moved farther to the right than the rod held by the clutch can go. How much farther the stirrup goes than the clutch and rod depends upon how far the apparatus moved to the left in the application of the brake. When this difference of movement in release equals the thickness of one washer, the next washer drops and takes up this slack. In this way the brakes are applied several times, until there is enough brake shoe wear and consequent slack to drop another washer. The washer then drops, and the operation is repeated. The slack of the shoes can thus never exceed a certain amount, determined beforehand by the construction of the apparatus.

Perhaps the most notable features in favor of the device are the facts that it is applicable to any brake gear now in use by drilling the hole *H* and welding the connection with the gibs to the lower connection rod of the truck; that little strain or wear is brought upon any of the few working parts, as they are never in action when the brakes are applied, and that its simplicity and lack of machine fitted parts indicate continued service and durability. This apparatus will be made by the Dunham Manufacturing Company.

The Stewart-Hall Train Order Signal.

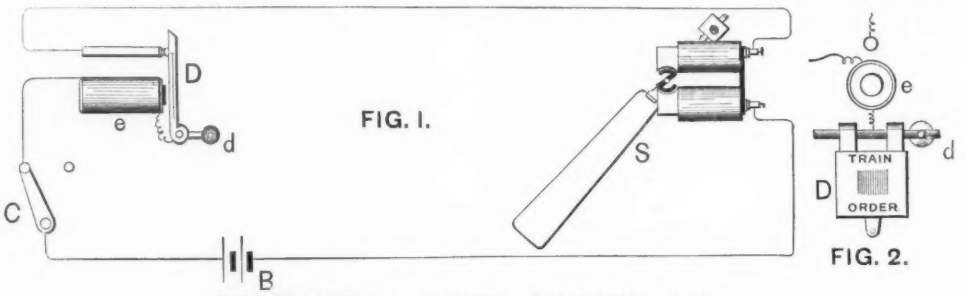
The diagram printed herewith shows the arrangement of wires and electromagnets used in a train order signal recently patented by Robert Stewart, Superintendent of Telegraph of the Central of New Jersey and W. P. Hall, President of the Hall Signal Company. The special features of the signal are, 1, that it works entirely by electricity, so that it can be placed in the most convenient location, and not necessarily in front of the office; and 2, a provision against letting a train pass while there are orders for it, through the operator's forgetfulness. As is well known, the last mentioned purpose is appreciated by practical superintendents and dispatchers and various devices have been heretofore invented for accomplishing it. The convenience of locating the signal itself some distance beyond the station, so that a train can be held for orders, and at the same time permit it to stop where passengers or freight can be dis-

charged and the tank filled with water, is obvious. This, of course, requires two signals, one for movements in each direction. The out-door signal may be either the Hall disc signal as used in the block system of this company or the semaphore shown below.

The electromagnet *S*, in fig. 1, represents the signal instrument, the presence of the electric current in the coils holding the signal in the safety position as shown. *D* represents the "drop," which is mounted in a cabinet fixed at some place in the office where the operator must leave his desk in order to reach it. It will be seen that whenever the circuit is opened the armature, in falling away, opens its own circuit in such a way that it can be again closed only by lifting the armature of *D* by hand. As will be seen in fig. 2, this armature carries a tablet lettered so as to warn the operator of the fact that a train order is on hand. The opening of the circuit permits this tablet to fall from its hidden position to a stop which leaves it in front of a glass-covered opening in the case.

On receiving an order for a train the operator sets the signal at danger by opening the switch *C*, which is located on his desk. If now, when the train arrives, he should forget that he is to stop it, and should attempt to clear the signal by closing the key *C*, he would find that the signal remained at danger, and on going to the cabinet *D*, to close the circuit by lifting the armature, would be reminded by the tablet of the presence of the train order. The lifting of the armature is accomplished by means of a large push button or plunger, and this button can be arranged with a clip to receive a folded order, so that the circuit cannot conveniently be closed without first picking up the order.

Two of these signals have been erected at Somerville, N. J., on the Central of New Jersey, one for westbound and one for eastbound trains, and the Hall Signal Company, on Thursday of last week, exhibited their workings to a party of railroad officers, taking them by special car from New York. The manufacturers entertained the party with an elegant lunch on the train and incidentally gave them a chance to see a fine new passenger station—that of the Central road at Somerville. This station is small, but in tasteful appointments and well arranged conveniences is a model.

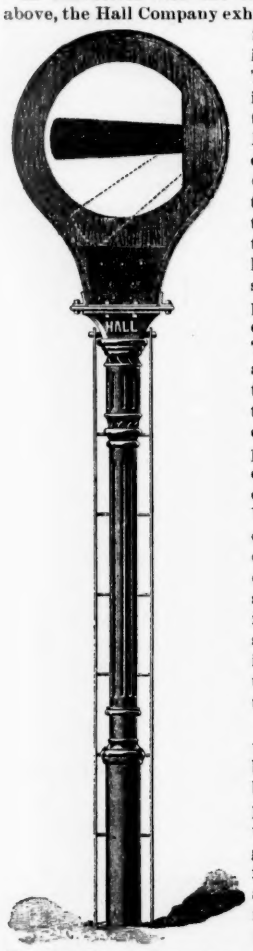


THE STEWART-HALL ELECTRIC TRAIN-ORDER SIGNAL.

Arrangement of Instruments and Wires.

The Hall Illuminated Electric Semaphore.

In connection with the train order signal described above, the Hall Company exhibited at Somerville its new form of semaphore, shown in the accompanying cut. The mechanism for operating this signal is precisely the same as that used in the Hall disc signal, heretofore described in the *Railroad Gazette*. In the disc signal the counterweight is lighter than the signal, but in the semaphore it is made heavier so that the arm shall assume the horizontal position in case of failure of the circuit or operator. The cut shows the signal as actually used at Somerville, the case being a modification of the pattern used for disc signals, but the company is making plans for a case with a glass-covered opening of a different shape. With a rectangular opening of the right proportions the ordinary semaphore can be quite closely imitated, the side of the case answering for the post. The angle shown by the dotted line in the cut does not indicate the limit of the power of the magnet.



The Hall Electric Semaphore.

The opening in the case, which furnishes a light background for the dark blade, is covered with transparent glass in front, and with ground or painted glass at the back. The lamp for illuminating the signal at night is placed 18 in. or more away from the case, and is fitted with a reflector shaped to diffuse the rays of light equally over the whole surface of the glass. The blade is made of silk or cloth stretched on a hollow wire, the same as the Hall disc, and is therefore sufficiently translucent to show its color at night. It can be made of any desired color that contrasts sufficiently with white.

Wrecking Outfits and Handling Wrecks.*

BY P. W. HYNES, WRECKING FOREMAN B., C. R. & N. R. R.

V.—DERRICKS.

Among the most important of modern appliances for handling wrecks may be mentioned the portable derrick which will be dealt with in this chapter.

*Copyright, 1890, by P. W. Hynes.

The portable steam derrick has been widely introduced of late, and has often engaged the attention of the mechanical engineers who have sought to solve by means of it the always vexing problem of delays. Great sums have been spent to accomplish this end, but I do not think they have been justified by the results. By the use of steam there is always a tendency to try to accomplish by force what can be better done by strategy. In consequence the steam derrick is often broken and the repairs are costly. Moreover, the breakdown always occurs at the scene of a wreck and adds vastly to the delays.

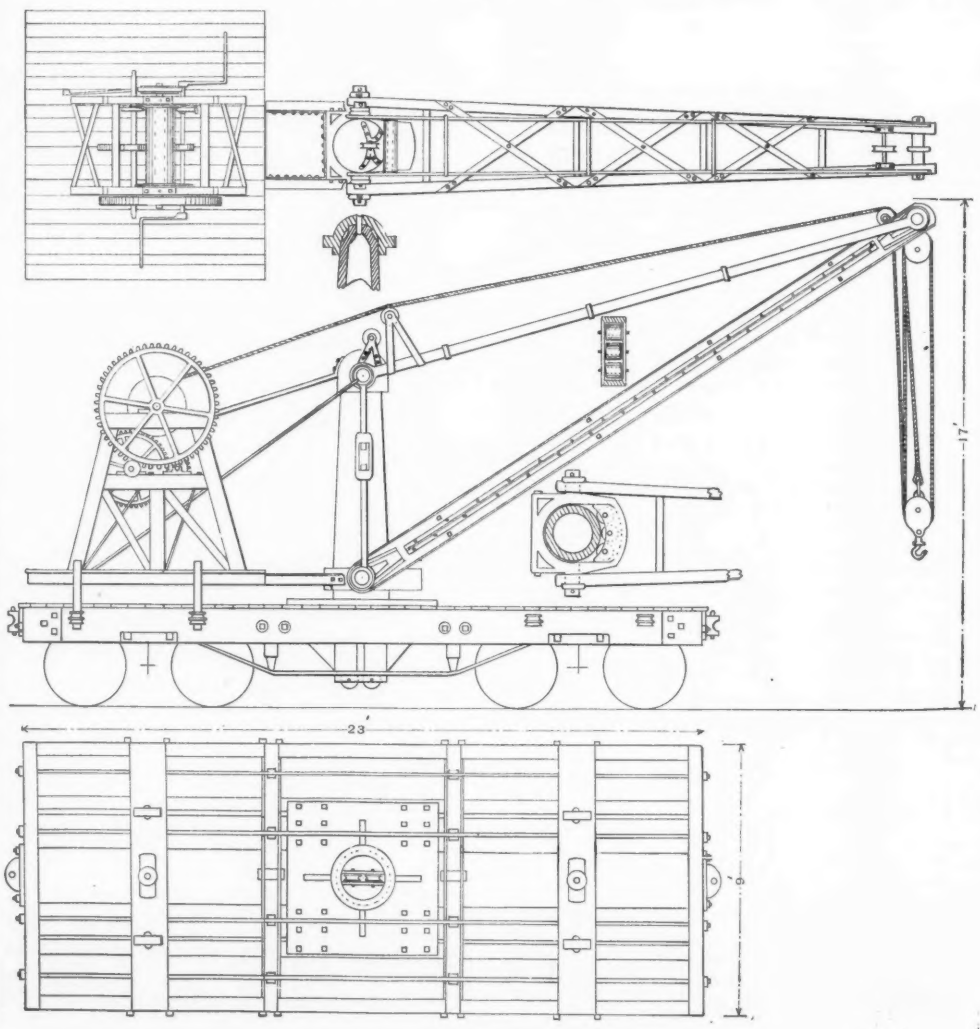
Another form of steam derrick is the combined steam shovel and derrick. This is a makeshift and is fortunately seldom available, being usually safely side tracked in some remote gravel pit. Still another pattern is that in which the line is worked by the locomotive. There are several forms of derricks which are worked either partly or altogether by hand power, and these form a class by themselves. They may be sub-divided into three classes, however, those having a derrick at each end of a flat car, those having a derrick at one end only, and those having one derrick placed in the middle of the car. The first has, to a certain extent, the advantage of stability, owing to the greater weight of the long car. The second is very undesirable because it is useless if turned wrong end foremost. The last named pattern meets the general conditions with the fewest drawbacks and is the one of which I shall treat.

The sketch attached shows, in plan and elevation, the outlines without dimensions of a derrick car designed to handle weights of 15 tons lift. It is so arranged as to operate by hand power or by means of a locomotive drawing on a line which passes down through the pillar and under the car.

The truck has a frame of forged steel, oak bolster, 33-in. wheels and M. C. B. standard journals and boxes. All springs are omitted. In order to give play to the trucks the car is raised on the centre so as to leave ⅜ of an inch between the side bearings.

The car is framed of seasoned oak 23 ft. long and 9 ft. wide over all. The side and end sills are 14 in. × 5 in., and the six intermediate sills are 10 in. × 6 in. These latter are placed three on each side of the centre and 2 in. apart, leaving a middle space of 24 in. or thereabouts. The frame is fitted together in the usual way and strengthened by longitudinal and transverse truss rods, corner plates and cross ties. The rods are of 1¼-in. round iron. The deck is laid as usual and the seams calked with oakum and melted pitch to exclude water. In the centre of the car above the floor is a cast iron plate 5 ft. square and 2 in. thick. Under this, on the lower side of the intermediate sills, is a similar plate which, however, is cast in one piece with a deep sleeve and strengthening brackets. These two plates are firmly bolted together by 24 one-inch bolts, of which four pass through each of the intermediate stringers or sills. The pillar is also of cast iron and made hollow. It is 11 ft. high, including the cap, and has a diameter of 22 in. outside and 15 in. inside at the car floor. From this point it tapers to an outside diameter of 12 in. and an inside diameter of 5 in. at the bottom of cap. The top of the pillar is turned to fit the inside of the cap and the foot is turned to a nice fit with the sleeve of the lower plate. When in position the pillar is stepped in the sleeve, being supported by a ¼ in. shoulder which rests upon the top of the lower plate. The cast iron cap is fitted with trunnions diametrically opposite each other, and has also a strong sheave which leads down directly through the centre of the cap and pillar. The sleeve of the lower plate has two corresponding pulleys, as shown, so that the hauling line may be carried down to the bottom of the pillar and thence in either direction under the car to couple with a locomotive.

Supported by suspension rods, with appropriate turn buckles, from the trunnions of the cap, is a collar which



FIFTEEN-TON PORTABLE DERRICK

hangs a little above the deck and bears against the base of the pillar on three rollers. This collar receives on its trunnions the thrust from the foot of the boom, which is slightly counteracted by the thrust of the winch platform, which bears against the collar from the opposite direction.

The boom is formed of two steel channel bars, ½-in. thick, 12 in. deep and having 4-in. flanges. These members are 22 ft. long between centres, and are stiffened by having a steel tee bar ½-in. thick with 4-in. flanges riveted along the side of each. The boom is supported at the upper end by guy rods which engage a 4-in. pin. These guy rods carry the weight back to the trunnions on the cap of the pillar. When in position the boom plumbs 7 ft. from the end of the car and stands 17 ft. above the rail over all.

The winch frame here shown is framed of oak, but angle iron or a cast frame may be better. The winch consists of a winding drum 12 in. in diameter and 2 ft. 7 in. long. The main wheel is 48¼ in. in diameter, and, with the drum, is carried on an axle 3¼ in. in diameter. This wheel gears into a pinion wheel of 6¼ in. diameter, which is carried on a 2½-in. axle. On this latter axle is carried, besides the clutch and ratchet wheel for throwing the power out of gear, a 30¼-in. cog wheel, which engages with a secondary pinion 8 in. in diameter, carried on an axle 2 in. in diameter. Both pinion axles are squared to receive the winch handle, but the latter one is used only for developing unusual power. To resist the strain of the hauling line on the drum, braces are carried from the winch platform to the cap trunnions. A winch brake is provided on the drum in such a position as to be readily operated at the time of throwing out of gear.

The hauling line passes through double steel blocks as shown, and over a single pulley at the end of the boom; thence it is carried to the winding drum or through the pillar to the locomotive at will. It will be seen at a glance that all parts are so arranged as to revolve with the boom, still maintaining their relative positions, the car and pillar alone being unable to rotate.

Buildings and Structures of American Railroads.*

BY WALTER G. BERG.

NO. 12—WATER STATIONS.

The water supply at shops, engine houses, station buildings, etc., is very frequently connected with the water service for road engines at the same point. The provisions for the water supply at each locality, therefore, depend to a large extent on the combination of requirements. The choice and location of a system for supplying road engines is determined according to whether or not the tender is to be filled before the engine starts on its regular run. The addition of the shop, engine house and station service to a water system for supplying road engines will increase the quantity of water required and call for a greater pressure height. Where this additional supply is large the problems to be solved are analogous to those encountered in a water-works system, and hence this feature of the water supply on a railroad will not be discussed in detail in this article.

It is essential to have double or independent water systems at all important points, so far as possible, so as not to cripple the road in case of temporary interruptions in one of the systems. The water stations for the road supply should be so spaced along the line as to offer at all seasons of the year an absolutely reliable and ample supply for the heaviest possible traffic to be expected, and to allow for repairs or interruptions at one or several water stations at the same time. Water stations for the engine supply along the road are generally located within a reasonable distance of the source of supply, wherever it is found, although the location at a regular station is preferable, where feasible, so as not to require engines to make special stops between stations.

The importance of the water service in the operation of a road arises not only from its necessity as a technical feature, but from the fact that it forms one of the permanent elements of the cost of operation. The United States census report of 1880 shows that the water supply formed on an average 0.68 per cent. of the total operating expenses of American railroads, the range on different roads being from 0.11 to 0.96 per cent., and the average cost per train mile 0.6 cent. The cost of water service on the Pennsylvania Railroad system from 1879 to 1883 was reported as follows: Operating expenses, 0.602 cent per train mile; maintenance, 0.368 cent per train mile, or a total average expenditure of 0.97 cent per train mile. On the Lake Shore & Michigan Southern the cost of water service from 1872 to 1881 is given as 0.6 cent per train mile. The cost of water supply, therefore, would seem to run from less than half a cent to a cent per train mile, with a fair average of two-thirds of a cent.

The quantity of water required is dependent on the number of engines liable to take water per day, the duty required of them, their size and water consumption, the capacity of the tender tanks, the distance to the next nearest water station on the road, and any special duty in addition to supplying road engines that the water service is to perform. The quantity thus ascertained should be increased at least 50 per cent. to allow for fluctuations in the supply, rapidly repeated drafts on the supply at certain times during the day, waste of water in filling tenders and loss by reason of the overflow in reservoirs. Mr. P. H. Dudley in 1882 ascertained that heavy and fast passenger trains on the New York Central & Hudson River Railroad, working at 135 lbs. steam pressure, evaporated 6.67 to 7.5 lbs. of water per pound of coal used, or about 40 gallons per mile on an average, the coal consumption having been from 40 to 50 lbs. per mile. A heavy freight engine burning 100 lbs. coal per mile would use about 80 gallons of water per mile. On stretches of a road with heavy grades the consumption is naturally larger, in addition to the allowance for pusher engines, where used. The capacity of tender tanks varies considerably, ranging from 2,200 to 4,000 gallons, the usual size being about 2,800 to 3,000 gallons.

The quality of water used has a most important bearing on the repairs and the life of a boiler. Bad water induces priming, causes a deposit, or corrodes the iron rapidly. A chemical examination of the water to be used should always be made to determine its chemical composition and its percentage of incrusting matter. On the Chicago, Burlington & Quincy it was found that in a tank of 2,750 gallons there were 1.92 lbs. of incrusting matter in the best water used on the road, and 11.33 lbs. in the worst water in use. Theoretically, therefore, an engine, as above, consuming about 18 tanks of water per week, would in that time collect 34½ lbs. of incrustation, under the best conditions, and 204 lbs. under the worst conditions known on the road mentioned. While practically the actual deposit would not be so large, if the engine is kept properly cleaned out, and because considerable of the deposit is carried off mechanically, the figures, taken as they are from actual experience, serve to illustrate clearly the importance of the question. Muddy water should be avoided, or else settling basins or reservoirs introduced, in case the water constantly carries a large quantity of matter in suspension. Water from streams is generally better than water from wells or springs, but in rainy seasons it will carry considerably more sediment. Spring water that does not contain injurious alkalies or salts to a serious degree, and water collected in storage ponds from the rainfall, if clear, are considered the best for use in boilers. If the water available in the immediate neighborhood of a given point is found, on proper examination, to be too hard, chemically impure, or otherwise objectionable, it will, in all probability, prove advantageous to locate the proposed water station elsewhere, or even to adopt a costly pipe line to bring good water from a more distant source.

At stations on a single track road the water tank is located at one end of the station opposite to where the engine stands when trains in one direction make their regular stop, while at the other end of the station a stand-pipe, supplied from the water tank, serves for the trains going in the opposite direction. Where a stand-pipe is omitted, the trains in one direction have to make a special stop for water. At stations on double track roads it is customary to combine a water tank or stand-pipe along one track at one end of the station with a stand-pipe along the other track at the other end of the station; or the tracks are spread at one end of the station and a stand-pipe is placed between them, connecting with the water tank, which, in this case, can be located off sideways somewhere on probably less valuable ground. In locating water tanks along a road the possible subsequent double tracking or four tracking of the road should be considered, and the tank located accordingly, which, however, in certain cases, would absolutely necessitate the use of stand-pipes. Where there are more than two tracks the spreading of the tracks and the placing of stand-pipes between them becomes necessary. The pipes connecting a water tank with a stand-pipe should be not less than 6 in. in diameter, preferably 8 in., and even larger if the distance is considerable, so as to reduce the loss of head by friction and enable the water to reach the stand-pipe as fast as it can be drawn. Where the distance from the central or main tankage system to a stand-pipe is very great, as, for instance, an isolated stand-pipe at the far end of a station or yard layout, it will frequently prove more economical to locate a small auxiliary tank opposite the stand-pipe, with sufficient storage capacity to fill several engine tanks, as the supply would be taken by gravity from the main tankage system through a much smaller pipe than if the engines were drawing directly from the pipe.

Wooden water tanks are probably in universal use in this country, and they form a distinctive feature of American railroading as compared with European practice, where iron tanks are preferred. Wooden tanks are generally built circular in shape and the staves and sundry parts are turned out to a large extent by machinery and kept in stock, so that repairs and renewals can be made very cheaply and quickly. In addition to these features, and the cheapness in the first instance, wooden tubs afford, when roofed over, in themselves a protection against cold, which could not be obtained in an iron tank construction without a special building or lining around it. With a view to making repairs, cleaning out sediments and similar causes for interruption to the service, several smaller tubs are preferable to one very large one, although the first cost of a large tank is less than that of several smaller ones offering combined the same storage capacity.

As mentioned above, the ordinary wooden tank, in con-

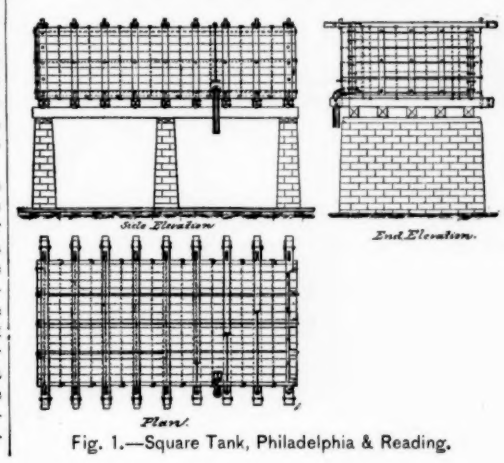


Fig. 1.—Square Tank, Philadelphia & Reading.

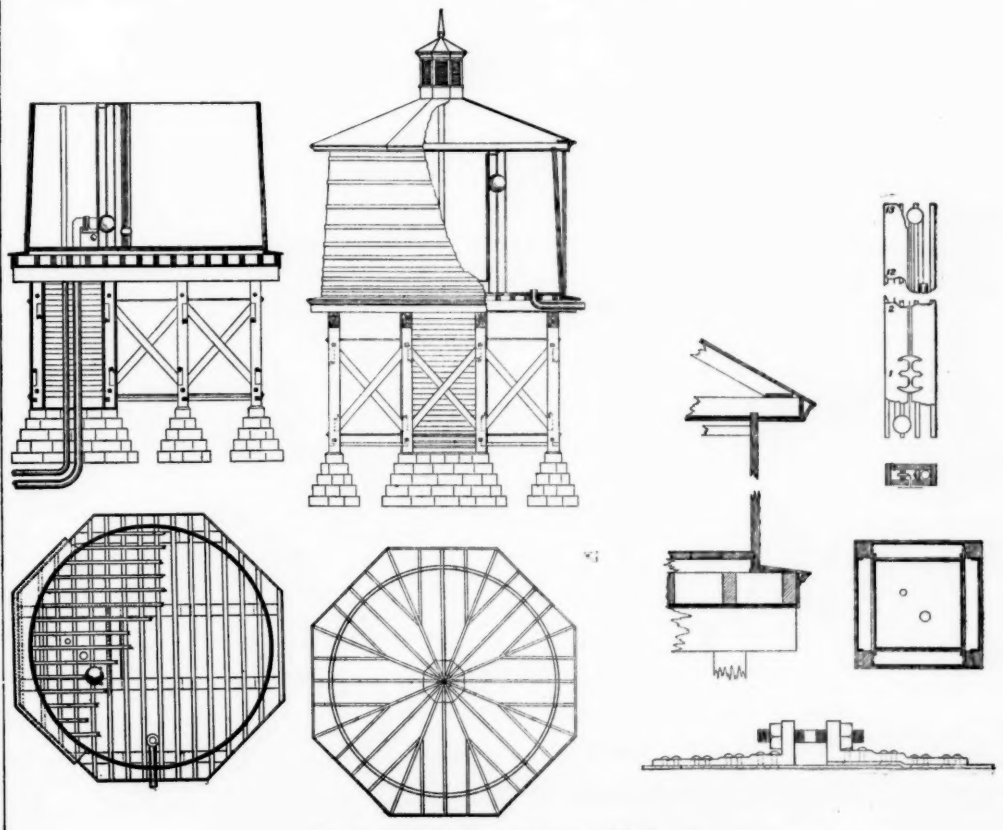


Fig. 2.—Standard Tank, Pennsylvania Railroad.

* Copyright, 1890, by Walter G. Berg and condensed from a forthcoming book on the subject.

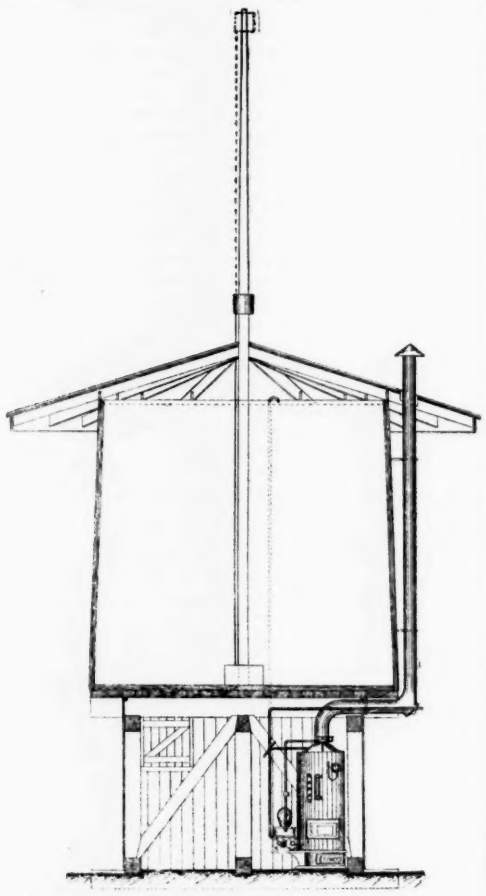


Fig. 3.—Standard Tank, Savannah, Florida & Western.

nection with a tight roof over it, offers in itself a certain amount of protection against cold. In northern climates an additional safety against freezing is gained by the use of so called frost-proof water tanks, which merely consist of the usual wooden water tank, with the addition of closed air spaces above and below the tank. An additional precaution is to inclose the entire space under the tank, which space can be used as pump room or for storing miscellaneous road supplies. Inclosing the space below the water tank, or the entire tank and the space below it, by a special building heated by a stove in winter, generally burning refuse coal from a coal dump, is still used to quite an extent, although the adoption of a frost-proof water tank is gradually superseding the older systems.

Below will be found a series of descriptions and illustrations of water tanks, for which probably every road has a standard, and which, in the main, form the most distinctive feature of the water supply on American railroads.

Square Water Tank, Philadelphia & Reading Railroad.—The standard square water tank on the Philadelphia & Reading, shown in fig. 1, is a wooden, box-shaped tank, 15 ft. wide in the clear, 29 ft. long in the clear and 8 ft. deep, set on wooden floor beams and brick piers. The floor of the tank is set 13 ft. above the top of rail. The floor beams and supporting timbers under the tank are 12 in. × 12 in., spaced as shown. The tank is formed of plank fitted closely together, properly calked, and bound by yokes, standards and iron tie rods. The advantage claimed for this style of tank is that it is much cheaper to build than the usual circular tanks and does not require as high a class of labor to put it together, and, hence, under certain conditions, especially where lumber is cheap, has particular advantages over the circular tank, which is dependent on shop work in order to be made economically.

Standard, 14 ft. × 22 ft., Circular Water Tank, Pennsylvania Railroad.—The standard, 14 ft. × 22 ft., circular, frost-proof water tank of the Pennsylvania Railroad, shown in fig. 2, with a capacity of 35,040 gallons, is 13 ft. deep in the clear, and 22 ft. inside diameter at the bottom and 20 ft. 10 in. inside diameter at the top. The sides are built of 3-in. staves, and the floor is built of 3-in. plank. The tub is bound by 10 wrought iron hoops, 4 in. × $\frac{5}{16}$ in. at the top of the tub and 5 in. × $\frac{5}{8}$ in. at the bottom, spaced 30 in. centres at the top and diminishing to a spacing of 8 in. centres at the bottom. The floor of the tub rests on 3-in. × 5-in. joists, spaced about 18 in. centres, resting on 5-in. × 12-in. floor beams, spaced 18 in. centres, which in turn are supported by four trestle bents placed parallel with the track and spaced 6 ft. 10 in. centres. Between the caps of the trestle bents and the floor beams there is a 1-in. floor, with a layer of building paper inserted, which forms, together with the bottom of the tub, an air space underneath the tank. The caps of the trestles are 12 in. × 16 in., the posts are 12 in. × 12 in., the outside bents having each two posts, the inside bents each four, and the bents being prevented from spreading by 1-in. tie rods, by 6-in. × 8-in. X bracing, and by 4-in. × 6-in. horizontal struts near the ground level.

The roof is circular, with 3-in. × 6-in rafters and 3-in. × 8-in. tie beams, sheathed on top of the rafter and below the tie-beam with 1-in. boards. Building paper is inserted above the sheathing under the tie beams. Thus the tank has on the top and on the bottom a double sheathing, forming air spaces, which prevent the water from freezing. The supply pipes and overflow pipes enter the tub through the bottom and are inclosed in an 8-ft. box between the bottom of the tank and the ground, which box is sheathed on the inside and outside with a layer of building paper and 1-in. boards. The supply pipe is closed with a Ludlow valve. An 18-in. copper ball float is connected with a marker on the outside of the tank to indicate the height of the water. The height of the tank above the track is varied according to local circumstances.

Standard, 15 ft. × 16 ft., Circular Water Tank, Savannah, Florida & Western Railway.—The standard circular water tank of the Savannah, Florida & Western Railway and also of the Charleston & Savannah Railway, designed by W. B. W. Howe, Jr., Chief Engineer, shown in fig. 3, is 15 ft. deep in the clear, 16 ft. 1 in. outside diameter at the bottom and 15 ft. outside diameter at the top. The bottom of the floor of the tank is set 8 ft. 6 in. above the top of rail and the centre of the tank is set about 19 ft. from the centre of the track. The sides of the tub are made of 3-in. staves and the bottom is made of 3-in. plank. The roof is octagonal, covered with 1-in. tongued and grooved boards on 2-in. × 6-in. rafters and with $1\frac{1}{2}$-in. × 9-in. facia boards. The roof has a manhole 16 in. × 20 in. in the clear.

The tub is supported on a solid 4-in. plank floor 16 ft. × 16 ft., which rests on 3-in. × 12-in. floor joists, spaced 15 in. centres. The floor joists are supported by three trestle bents, placed perpendicular to the track and spaced 5 ft. 10 in. centres. Each trestle bent has three posts 10 in. × 10 in., and the sills and caps are 10 in. × 10 in. The bents are braced by 8-in. × 8-in. braces. The foundations of the bents are three 12-in. × 12-in. mud sills.

The inlet pipe enters the tank from the outside at the top. The outlet pipe is tapped into the side of the tank just above the floor, and is closed automatically by a weight. As soon as the galvanized iron delivery spout is drawn down by the train hands and the back end of the spout strikes the socket of the discharge pipe, the valve is opened, thus allowing the water to run freely. The method of tapping the discharge pipe into the side of the tub above the floor will enable clearer water to be delivered, as mud and sediments collecting on the floor of the tank cannot be flushed into the pipe. The gauge for marking the height of water in the tub is a ring fitting around an upright pole, like a flagstaff, on top of the roof. The ring or circular disc moves up and down this pole according to the height of the galvanized iron float inside the tank, thus allowing trainmen to see from quite a distance how much water is in the tank, without having to wait until they get up to and opposite the tank.

Standard, 16 ft. × 16 ft., Circular Water Tank, Northern Pacific Railroad.—The standard, 16 ft. × 16 ft., circular water tank of the Northern Pacific Railroad, designed by C. B. Talbot, similar to the water tank shown in fig. 4, has a capacity of 21,000 gallons, and is 15 ft. 2 in. deep in the clear, 16 ft. inside diameter at the bottom and 15 ft. 4 in. inside diameter at the top. The floor of the tank is set about 11 ft. 6 in. above the top of the rail. The top of the delivery spout at the back end is set 10 ft. 7 in. above the top of rail, and the centre of the tank is located 17 ft. 9 in. from the centre of the track, using a 9-ft. 2-in. spout.

The tub is built of $3\frac{5}{16}$ in. staves and floor plank, and is bound with 12 wrought-iron hoops. The roof is circular, with 2-in. × 6-in. tie beams and 2- in. × 4 in. rafters, covered with boards and shingles. The bottom of the tie beams is sheathed with 1-in. plank, forming with the roof sheathing an air space on top of the tank, which, with the air space at the bottom of the tank, as described below, renders the tank frost proof. The floor of the tank rests on 2-in. × 6-in. floor joists, spaced 8 in. centres, placed parallel with the track and

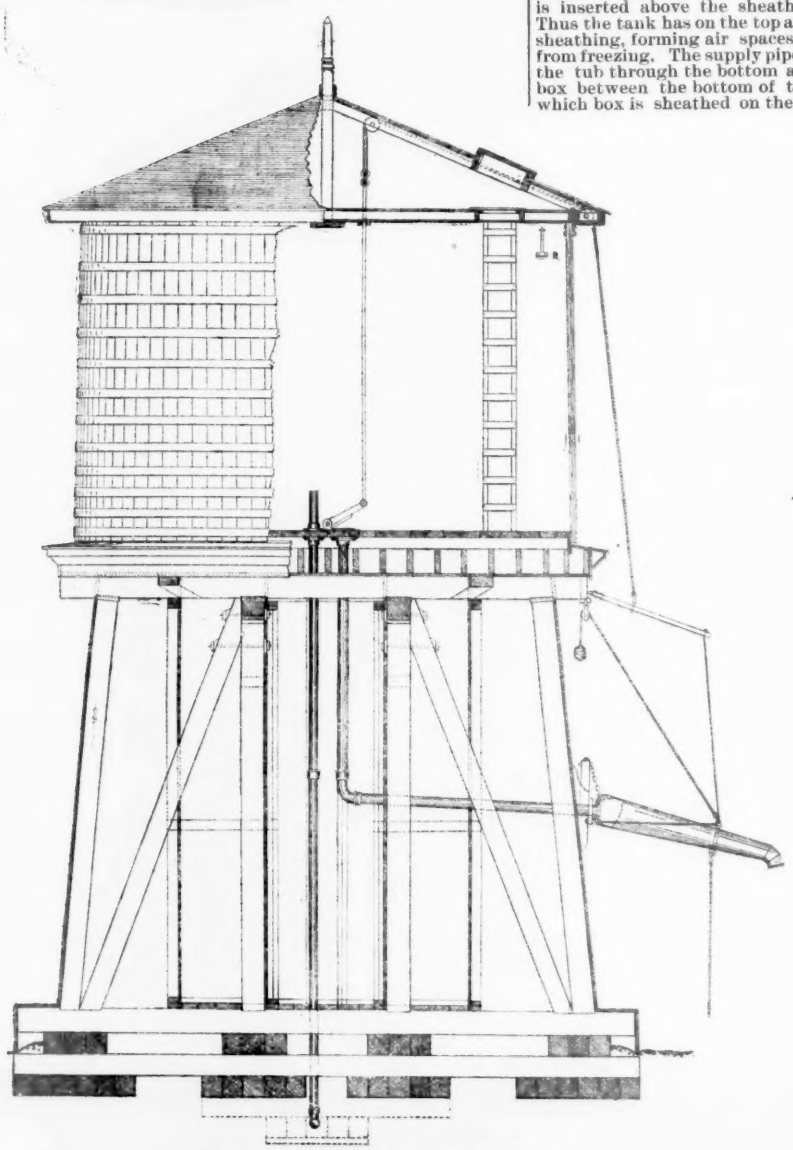


Fig. 4.—Standard High Tank, Northern Pacific.

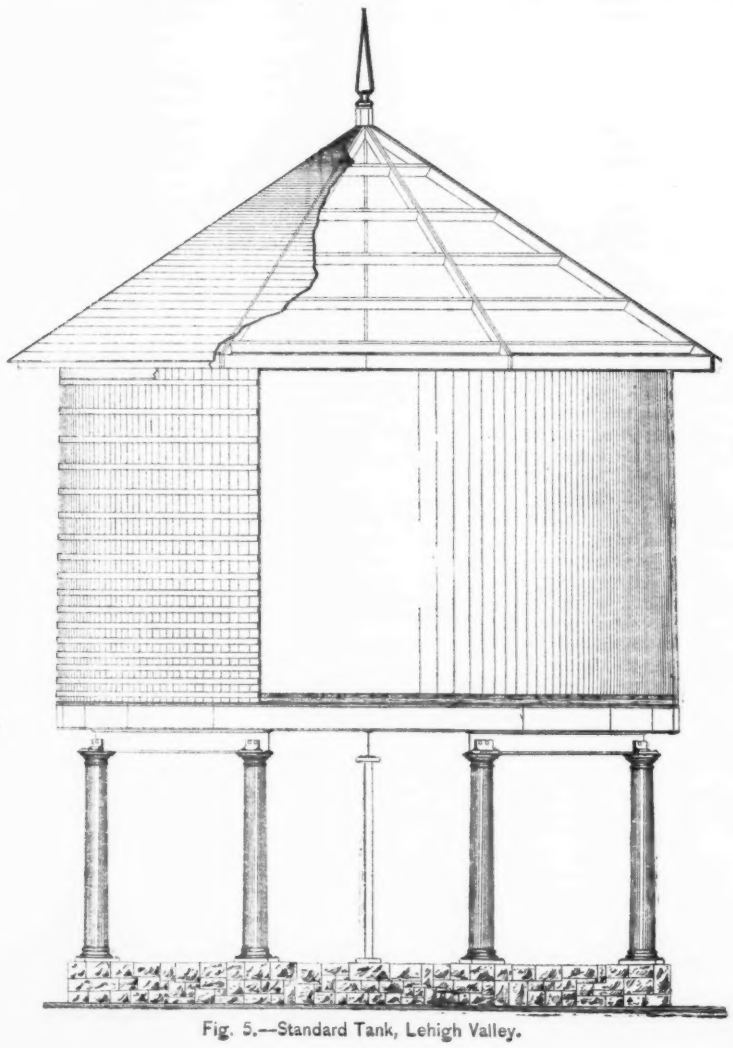


Fig. 5.—Standard Tank, Lehigh Valley.

resting on 3-in × 12-in. floor beams, spaced 15 in. centres, and placed perpendicular to the track. Between the floor joists and floor beams there are 1-in. boards, thus forming an air space with the tank floor. The floor beams are supported by four bents placed parallel with the track and spaced 4 ft. 8 in. centres. The outside bents have each two posts and the inside bents each four posts. The caps of the bents are 12 in. × 12 in., the posts 12 in. × 12 in., the sills 12 in. × 16 in. The bents are appropriately braced with struts and tied together with rods. The pipes entering the tank through the floor are inclosed between the ground and the floor of the tank in a pipe chamber, a notable feature of the design being the care taken to protect this chamber from the cold. The chamber is 3 ft. 6 in. square inside, and is surrounded by four different walls of 1-in. plank, one outside of the other, forming thus from the outside in first a space of 18 in. filled with sawdust, then a 24-in. air space, and lastly a 12-in. space filled with sawdust.

The discharge pipe leaves the tank near the centre of the floor, and is closed by a lid valve operated from the outside by appropriate fixtures; it runs under the floor between the floor beams to the face of the tank, where it connects to a counter-weighted goose-neck.

High Water Tank, Northern Pacific Railroad.—The high water tank of the Northern Pacific, shown in fig. 4, designed by C. B. Talbot, with a capacity of 49,000 gallons, is the usual standard, 16 ft. × 24 ft., circular water tank of the same road, placed on a higher trestling than usual, in order to obtain a greater pressure at the outlet pipe. The floor of the tank is set about 25 ft. above the top of rail, while the delivery spout is kept at the usual elevation. The outlet valve on the floor of the tank is opened automatically when the delivery spout is pulled down, and closes as soon as the spout is pushed upward.

Throughout this design the greatest care is taken to form air spaces, and spaces filled in with sawdust, so as to protect the pipes under the tank, and also to keep the water in the tank from freezing. The outside of the trestling under the tank is sheathed with weather boarding as an additional protection against severe weather.

Standard, 16 ft. × 30 ft., Circular Water Tank, Lehigh Valley Railroad.—The standard, 16 ft. × 30 ft., circular water tank of the Lehigh Valley Railroad, shown in fig. 5, designed by Wm. F. Pascoe, Superintendent of Bridges, Lehigh Valley Railroad, with a capacity of 75,154 gallons, is noteworthy on account of its size and the permanent character of its substructure, namely, wrought iron beams on cast iron columns and stone foundation walls. The tank rests on nine wrought iron 15-in. rolled I-beams, 150 lbs. per yard, spaced from 37 in. to 44 in. centres. These floor beams are supported through the centre by a wrought iron 15-in. rolled I-beam, 200 lbs. per yard, resting on four columns, each column consisting of a wrought iron 9-in. rolled I-beam, 100 lbs. per yard. The floor beams are supported at their ends by wrought iron 12-in. rolled beams, 170 lbs. per yard, connecting on six sides the corners of an octagon formed by eight cast iron ornamental columns, which transmit the load to the stone foundation. These cast iron columns are 10 ft. high, 11¾ in. outside diameter at the top of the shaft and 14½ in. at the bottom, and have a base 20 in. square. The thickness of the metal in the columns is 1¼ in. The foundation wall is 28 in. wide on top, with appropriate openings for the passage of pipes underneath the ground, which pipes ascend to the tank in a frost-proof pipe chamber, for which a special foundation wall is built, as shown on the plans. The floor of the tank is usually set about 15 ft. above the top of rail.

In general it can be said relative to the water tanks on the Lehigh Valley Railroad that they are usually connected with stand-pipes located between the main tracks, or alongside of leaders, or at the head of yards, in which case attachments for the delivery of water directly out of the tank through goose-necks, etc., are not required. The supply pipe and waste pipe are 4 in. in diameter and the delivery pipe is 8 in. in diameter.

The following estimates of the cost of the standard 20 ft. and 30 ft. tanks on wrought iron and cast iron columns and stone foundations have been kindly furnished by Mr. Pascoe, who states that the figures represent fair averages for usual conditions encountered.

Cost of a 20-ft. tank complete on wrought iron columns.

Masonry	$336.00
Wrought iron (15,775 lbs.)	500.00
Tub	302.00
Pipes, valves and laying	443.30
Erection	115.00
Total	$1,696.90

Cost of a 20-ft. tank complete on cast iron columns.

Masonry	$336.00
Cast iron (14,568 lbs.)	291.36
Wrought iron (11,997 lbs.)	373.11
Tub	302.00
Pipes, valves and laying	443.90
Erection	115.00
Total	$1,861.37

Cost of a 30-ft. tank complete on wrought iron columns.

Masonry	$402.00
Wrought iron (28,936 lbs.)	927.00
Tub	461.00
Pipes, valves and laying	486.30
Erection	189.00
Total	$2,465.30

Cost of a 30-ft. tank complete on cast iron columns.

Masonry	$402.00
Cast iron (15,340 lbs.)	366 80
Wrought iron (17,995 lbs.)	559.64
Tub	461.00
Pipes, valves and laying	486.30
Erection	189 00
Total	$2,404.74

Standard, 16 ft. × 24 ft., Circular Water Tank, Union Pacific Railway.—The standard, 16 ft. × 24 ft., circular water tank of the Union Pacific Railway, with a capacity of about 48,000 gallons, described and illustrated in the *Railroad Gazette*, issue of Sept. 5, 1890, is a wooden tank of the usual make supported on eight ornamental cast iron columns, bedded on stone piers. The tank is located between two tracks, and has spouts facing each track, affording thus extra facilities for the quick dispatch of engines taking water. For all details see the above mentioned issue of the *Railroad Gazette*.

Annual Reports of Railroad Commissioners.

KANSAS.

Messrs. James Humphrey, Geo. T. Anthony and Albert R. Greene, Railroad Commissioners of Kansas, have made their report for the year ending Dec. 1, last, but the pamphlet issued gives only the general remarks of the Board, the statistical portion having been delayed by the failure of the Atchison and Union Pacific roads to promptly send in their reports.

"All the principal lines in the state are in good condition, physically, and the service thereon is first class in every respect." The Kansas Central, recently changed from 3 ft. gauge to standard, is not is proper condition for profitable operation or for safety. The people of the state are "congratulated upon the indications that the mania of railroad building in Kansas is a thing of the past." The mileage of the state is now 8,891, an increase of only 85 miles during the year. The financial showing of the roads is fair, but the falling off in business resulting from the failure of crops in 1890 had not begun to show itself when these returns were made. The report has a page or two of accident statistics, some of which are held to show that Kansas roads are managed with nearly as high a degree of safety, especially to trainmen, as those of Great Britain, but the figures from Kansas are confessedly incomplete owing to the repeated failure of roads to follow the prescribed forms, and the conclusions are of little value. Moreover, the decimal point is wrongly placed in several instances, making the averages misleading.

The Board congratulates itself that it has partially succeeded in abolishing the arbitrary rebilling of freight at Kansas City and presents forcible arguments to show that the Missouri River, "that magic line of moving mud," is not a natural barrier to the movement of traffic. Commissioner Vanlandingham, of the Kansas City Transportation Bureau, says in his annual report that "the prospects from a rate standpoint for Kansas City are not very bright," and the Commissioners say that they fully agree with him.

Statistics are presented showing that the freight tonnage of the roads of Kansas has doubled within six years, while the earnings have increased only 21 per cent. The net earnings for the year ending June 30, 1883, on 9,264 miles of road provided for dividends of nearly four per cent., while for the last year the net earnings on 18,501 miles were less than one-tenth as much and would have paid dividends of only one-sixth of one per cent.

The report has a very sensible chapter on state control, clearly depicting the situation in Kansas, and concluding as follows:

After the "boom" the "boomerang." The companies found themselves confronted with fixed charges on non-paying trackage; the municipalities equally unhappy under a debt of aid bonds and extravagance in public expenditure. The one could not find relief through resort to excessive charges, nor the other through a repudiation of contract obligations; the majesty of the law would not permit it. Time, the one great healer of all curable wounds and ills, can alone set things right. Indeed, it has already done much to correct the errors and ills of this overdoing in Kansas enterprise. A phenomenal growth in population, agriculture and other productions, and rapidly accumulating wealth, together with the more prudent methods born of adversity, have done much already to relieve the strain, and will, we are confident, bring complete relief at no distant day.

This recital of facts, connecting the evils of the present with their cause in the past, is not for amusement, but to invoke a more careful and intelligent action than comes of passionate appeal and vindictive assault. We have 1,500 miles of railroad which is worse than worthless to its owners, and a burden upon the commerce of the state as a whole, although a blessing to the country along its line. It came by invitation, encouragement and support of the people, and cannot be ignored in the discussion of rate-making for the rest.

The principles of rate-making are correctly summarized, and the futility of a legislature attempting to make tariffs is shown. A commission is the only proper public body to do this, and the "commission's orders should be absolutely paramount" until vacated by a competent judicial tribunal on appeal. To suspend them pending appeal by the roads "is to make a farce of the whole commissioner system."

Thus while holding correct principles the Board still claims for itself the power of deciding which foot those principles shall be allowed to pinch. Judge Brewer's decision that roads should be allowed to earn a reasonable dividend is complained of, because the judge did not say how much water is allowable in stocks favored by a decision of that sort. Kansas sympathizes with Minnesota, and extracts are printed showing that the decision of the United States Supreme Court against the latter state is in direct conflict with the position taken by the "five eminent lawyers" of the Interstate Commerce Commission. The latter say that rate-making is an administrative process, to which rules of law are necessarily inapplicable, and that the work must, therefore, be done by an administrative body; while the Supreme Court says that the courts can review the orders of any commission. This does not exactly mean reviewing the specific acts of a legislature, though the Kansas Commissioners seem to want to view it thus; and they of course give us no new light as to how to get out of the dilemma.

MICHIGAN.

Railroad Commissioner John T. Rich, of Michigan, has issued the 18th annual report of his office. The report is just finished, but most of the statistics are for the calendar year 1889. The total mileage of *track* in the state was then 6,760, an increase of 5.43 per cent. over the previous year. Several hundred miles of ore and logging railroads are controlled by private parties and escape police regulations, and probably also taxation. The tracks of these roads are, in some instances, built across those of regularly incorporated roads at grade, and both road and rolling stock are often deficient in safety appliances; the commissioner should be vested with authority over these roads. During the year to Dec. 31, 1890, 200 miles of new road was built in the state, and 339 miles is projected for construction next season. Maps have been filed of 225 miles more. The mileage of road in the state Dec. 31, 1879, was 3,657, and the increase in the 10 years following was 85 per cent.

The financial part of the report includes summaries of stock and debt, with comparisons for 16 years, together with the other usual items. The earnings per train mile in 1889 were $1.22 and the expenses 94 cents. The percentage of expenses to earnings was 74.08.

Automatic freight car couplers, power brakes and other safety devices are discussed at considerable length. The enforcement of the law requiring uniform couplers should be postponed at least three years from the date now fixed, which is Jan. 1, 1891. The provision requiring new cars, and old ones repaired, where they are of modern make and size, to be equipped according to law should be enforced now. Most of the large lines now have air pumps on all freight engines, and nearly every freight train has enough air brakes in it to pay for using the power brake, but legislation will be required to compel some roads to adopt this system.

Continuous heating for passenger cars has not been satisfactorily tested on account of the mild weather. The department has required the removal of the more dangerous class of stoves and heaters, especially on fast trains. No cars should be run in the cold climate of Michigan without an emergency heater. In track work the number of men to a section is 4.21. About one mile of trestle has been filled in. Ninety-nine culverts have been replaced with iron pipe and 56 with cement pipe. Of the bridges erected during the past year, 5,400 ft. were of wood, 1,860 ft. of iron or stone, and 2,241 ft. unclassified. Surface cattle guards are commended. One kind, which was specially approved by an official order, was afterward found to be easily crossed by horses, but the animals were finally decided to be unruly, and the advantages of the surface guard are so great that this incident should not be allowed to hinder their introduction. There are 166 grade crossings of one railroad with another, and it appears from another statement that 65 of these have interlocked signals. This if correct is a very encouraging exhibit. There are 6,832 highway crossings in the state, of which 6,630 are at grade. The number of new crossings established since the last report was issued is 618, an exhibit the opposite of encouraging. Only 349 crossings were protected by gates, flagmen or signals, and the commissioner wonders at the smallness rather than the magnitude of the list of casualties.

Builders of new railroads neglect to fence them promptly and live stock runs at large in consequence. Some farmers have been obliged to sell their stock because, in consequence of destruction of fences by contractors, they have no means of controlling the animals.

Eight passengers, 60 employés and 110 other persons were killed, and 26 passengers, 282 employés and 86 other persons were injured on "Michigan railroads" during the year 1889. Whether all these casualties occurred within the state of Michigan does not appear.

Legislation is needed to protect individuals whose land is proposed to be taken by a new railroad, and the principle of the Massachusetts law providing for abolishing highway grade crossings and for assessing the cost of such changes is recommended for adoption in Michigan. The report continues:

The number of street car tracks now being built across railroad tracks at grade demand that some competent tribunal should determine under what conditions these crossings should be made. In this connection also should be considered the question of the height of electric wires above railroad tracks. Innumerable electric wires are being strained across the railroad tracks. To be safe for brakemen any obstruction must be 22 ft. in height above the rail. Several wires for furnishing power for the propulsion of street cars were at first erected at a height of 18 ft., and, as they sagged by the effect of the heat, they were in some instances considerably lower. So great was the danger to trainmen that an order was issued under the general powers conferred by law on the Commissioner of Railroads to raise the wires to a height of 24 ft. The two feet in addition to the height required for a bridge or other permanent structure was required for the twofold reason that the wire is not rigid, and that it is charged with an electric current sufficiently strong to be dangerous. The officers of the street car companies claimed that 24 ft. was higher than their trolleys could be made to work. After considerable negotiation they were raised to 22 ft. and securely fastened. While this is not as high as safety requires, it seemed to be the best that could be done under the circumstances, and the matter was permitted to rest. The law should regulate the height of all wires over railroad tracks and they should be permitted to be put up only in such a manner as to be secure, this to be determined by inspection by competent authority. Provision should also be made for the crossing of railroads by the tracks of street railroads with a stipulation also concerning what safety appliances should be erected for the protection of passengers on the respective roads.

The Qualities Essential for a Free Steaming Locomotive.*

BY A. E. MITCHELL, MECHANICAL ENGINEER N. Y., L. E. W. R. R.

To make a locomotive boiler steam freely, it is essential that it should be designed correctly, that the various

* Extracts from a paper read before the New York Railroad Club, at the regular meeting, Jan. 15, 1891.

parts should be adjusted properly, and that the fireman should obtain as perfect combustion of the fuel used as possible. Let us look into these qualities separately, with the view of making the subject plain and comprehensible.

THE LOCOMOTIVE BOILER.

The main feature in the design of a locomotive boiler is to get sufficient heating surface, and, having obtained this, the water space should next be taken into account.

Heating Surface.—From experience, based on practical observation and tests of many free steaming locomotives on several roads in this country, I have come to the conclusion that on account of the various qualities of good and bad coal used the greatest amount of heating surface possible to obtain, under the style of construction adopted, should be furnished, and that the boiler should be designed to supply one inch larger cylinders than are to be applied.

It is not worth while to enter into the method of determining the heating surface, grate area, etc., required, as you doubtless are all familiar with it, but I will give short, unscientific but handy rules, which I have found from data obtained by careful study of the free steaming locomotives which have come under my observation to give very approximate results which may be of value to many of you:

1st. Use cylinders one inch smaller in diameter than you design your boiler for.

2d. The smallest diameter of shell of boiler should be as nearly as practicable three times the diameter of the one inch larger cylinder.

3d. The required amount of heating surface in square feet, for bituminous coal-burning engines, should never be less than four times the square of the diameter of the one inch larger cylinder in inches. One-tenth of this heating surface to be in the fire box and the balance in the flues. On anthracite coal-burning locomotives more heating surface is needed in the fire box on account of the larger grate area required, but the heating surface of the flues, as given by above rules, should not be materially decreased. Care should also be exercised in deciding the length of flue to use; if made too long the temperature of the gases of combustion and the smoke as it enters the smoke box will be less than the temperature of the water in the boiler, thereby absorbing some of the heat of the water, and, if made too short, much heat is wasted which might be used to great advantage in generating steam.

The grates should be also designed to admit the greatest amount of air possible, as I know of no coal that can get too much of the oxygen of the air through the grates; but should there be, the amount of air admitted could be regulated by the dampers. Some time during the life of that locomotive, it may get coal that requires more air than it is possible to admit through the grates, and it would not then come amiss. The grates should be designed of such shape as will prevent clinkers from adhering to them, and thereby cause them to stick, preventing cleaning and at the same time partially stopping the admission of air which is so essential to the free combustion of coal.

Water Space.—Ample water space should be provided in designing the locomotive boiler. A large body of water at the temperature of the steam acts as a reserve force, ready to come to your assistance whenever necessary, and these times are very frequent; often a train is taken over the last few hundred feet of a long, heavy grade on account of this reserved force, when without it the train would have to stop and wait for the boiler to be filled and steam generated. The large water space has also another advantage—viz., the supply feed water in mixing with the large body of water in the boiler does not chill the mass as much as would be the case if the body of water was smaller.

THE SMOKE BOX AND APPLIANCES.

The Diaphragm Plate.—The object of the diaphragm plate is—

1st. To act as a deflector, to deflect the sparks and cinders to the bottom of the smoke box and thence into the extension front, which in turn acts as a storage receptacle to carry the sparks and cinders to the destination of the engine, where they can be dumped through usual hopper casting secured to the bottom of the extension front. With the half or shorter extension the heavy exhaust lifts the cinders and sparks and hurls them against the netting, causing them to become broken into particles sufficiently small to pass through and thereby escape to the atmosphere.

2d. The diaphragm plate is used to regulate the draft upon the fire, but does not increase the draft, or suction through the flues, as many suppose. Care must be taken to have the apron, or lower adjustable plate, attached to the fixed diaphragm plate, horizontal at its lower edge in order to have the fire burn uniformly traversely across the box. Lowering the diaphragm plates causes the fire to burn stronger at the front end of the grates, whereas raising the plate will transfer the strongest traverse fire line further back; but when this plate is properly adjusted, the coal will burn with nearly the same brilliancy over the entire surface of the grates. In adjusting this plate, I prefer to place it in such a position as will cause the fire to burn a little stronger, or brighter, at the front end, thus giving the unconsumed gases of combustion, liberated from the coal at the rear end, an opportunity of being consumed as they pass over the hotter fire at the front end. After this plate is adjusted properly for the average quality of coal, it should never be disturbed unless the engine were to burn continuously one grade of coal, when it should be adjusted for that special grade. The improper adjustment of this plate produces a large waste of coal, hence it should have the proper attention.

The High Nozzles.—The high nozzles are placed above the netting in order to have an unobstructed opening to the atmosphere, but, inasmuch as the netting must necessarily be above the opening below the fixed diaphragm plate, the nozzles will be at a height somewhere between the top and fourth row of flues and above the centre line of the boiler. The height of the nozzle, in my opinion, enters as a factor in the steaming qualities of a locomotive boiler, but to what extent I cannot state at present; the diameter of the nozzles, however, enters very materially as a factor in the steaming qualities of the locomotive.

Many draft their fires entirely by the nozzles, reducing their diameter to increase the draft on the fire and opening them to decrease the draft; hence we find many locomotives of to-day laboring under a heavy back pressure caused by too small a nozzle, this heavy back pressure crippling the power of the engine very materially and reducing the number of cars it is capable of pulling over the division.

The correct method of drafting a locomotive is, first, to enlarge the nozzles as much as possible and increase the draft, if required, by means of the stack, or at some other point; then, after all other methods of increasing the draft have been tried without avail, reduce the nozzles a little if more draft is required on the fire.

The Wire Netting.—The usual netting used is 3 × 3, or 3½ × 3½ mesh per in., No. 11 to No. 13 wire, Birmingham gauge. With this netting we get about 50 per cent. of opening for the gases and smoke to pass through, and care must be taken to have the netting of sufficient area to insure that the smoke and gases will have a free exit to the stack, otherwise it will choke the flues, and decrease the draft. I believe in making the area of netting at least four times the area of flue opening.

With the old style smoke box equipped with low nozzle and lifting pipe, the netting is placed in the bonnet of the diamond stack, the lifting pipe being used to adjust the draft on the fire and the diameter of same, together with the diameter of nozzles and stack, determining the amount of draft on the fire; with this device it is usual to place the bottom of the lifting pipe on a level with the nozzles, and regulate the draft by a sliding sleeve at the top. Reducing the diameter of the lifting pipe increases the draft, and enlarging this pipe decreases the amount of draft. Care must be taken not to get the pipe so small that the exhaust steam will be retarded by friction along its circumference, and that the stack is of a size to permit the steam to expand and fill it without choking; much of this can only be determined by experiment.

The smoke box as a whole should be absolutely air-tight, except at the stack opening, in order to maintain the partial vacuum required to produce the necessary suction through the flues; especially is this required with locomotives equipped with extension fronts, for the following reason: Sparks and cinders at high temperature are stored in the front, which are composed largely of unburnt coal and coke, requiring only a certain amount of the oxygen of the air to come in contact with them to produce combustion. If sufficient air is admitted through defective joints in the front end, this mass will burn, thereby partially or totally destroying the draft on the fire through the flues, besides causing the extension front to become red hot, distorting the shell, and increasing the difficulty of calking the joints to prevent a return of the occurrence.

SMOKE STACK.

The stationary chimney stacks of our mills and factories, which are giving the best results, have a larger internal area at the top than at the bottom, to permit the large volume of smoke and gases to expand and disseminate as they rise and thereby prevent choking; this same principle is applicable to the locomotive smoke stacks; here we have also the exhaust steam to take care of and aid us in increasing the draft on the fire. As I have said before, a partial vacuum must be maintained in the smoke box, varying from ½ to ¾ of a pound, and to obtain this we utilize the expansive feature of the exhaust steam as it passes through the stack.

The exhaust steam at high temperature and pressure, together with the smoke and gases of combustion, passing into the neck of the stack at a high speed, nearly fills it, and then, expanding rapidly and filling the stack, causes the partial vacuum to be maintained which is required, hence the reason why the stack should be larger at the top than at the bottom. This then converts the stack into an ejector, causing the partial vacuum to be maintained in the smoke box, in the same manner as steam driven at high temperature and velocity through the injector nozzle produces the vacuum in the feed pipe, which raises the feed water to the combining tube. Knowing, therefore, that the stack is practically an ejector, we can utilize it for producing an increased draft on the fire, and therefore make our exhaust nozzles larger, as can be determined by experiment. Under this rule different sizes of cylinders will require different sizes of stacks, but if we equalize these values of stack and nozzle diameters we find it possible to use one stack with all usual size cylinders (17 in. to 20 in. diameters) and vary the nozzle and draft accordingly. Having one stack to fit all locomotives, the cost of maintenance is wonderfully reduced, and if the stack is made of cast iron the scrap from a damaged stack will go far toward paying for a new one.

What Constitutes a Defect in a Vertical Plane Coupler?

At the January meeting of the New England Railroad Club the question for discussion was, "What constitutes a defect in a vertical plane coupler sufficient to condemn the coupler?" Mr. F. D. Adams, Boston & Albany, opened the discussion as follows:

This question of vertical plane couplers is one that has agitated the railroad community probably as much as any other for the last three or four years, and there is a wide difference of opinion in regard to the advantages of using the vertical face coupler instead of the pin-and-link coupler. We here in New England are in the minority on this question, but we have the consciousness of believing that we are in the right. We do not believe in the coupler, and in saying so I think I speak for the New England railroad men generally.

The question at issue to-night is, What amount of breakage is it proper for us to allow to pass in interchange? This question grew out of an order issued some time ago by Mr. Buchanan, of the New York Central, in which he gives positive instructions to his inspectors to refuse to receive the vertical hooks with defects of any description, however minute. That has made some obstruction on the road, . . . and it was decided by Mr. Buchanan and myself that we would leave to our men at Albany what cars to pass, with the defects marked upon them. I suppose everybody who has had any experience knows that the breakage of the vertical hook knuckle is very detrimental to the service of the coupler. In other words, if the knuckle is removed entirely, the result is, when the cast iron bar is coupled to it, the connection will break the bar; and this I suppose led Mr. Buchanan to issue his order. He found when we carded a car with the knuckle broken, we were only liable for the knuckle at an expense of about $4; but before it got many miles on his road the bar was broken, and that cost him $8 or $10. I found the same thing working against us and I had in mind the issuing of a similar order, and if I had done so should probably have roused the indignation of some other roads. We are removing knuckles or couplers, or both, for very small defects and it is very expensive business for the road.

Now the question arises whether it is best or proper or safe for us to transfer cars from one road to another with defects existing in the knuckles. We all know that when some parts of them break it weakens them very much, and the tendency is to break worse, and it goes on until they are destroyed. Now, how much of a break shall we allow our inspectors to pass? I am not prepared to say, though I have about made up my mind. I would be willing to take a coupler with a small fracture, where I wouldn't take one with a large piece broken off. . . . A coupler with half an inch broken off at the top or bottom, or in the centre either way, I would accept; but if both parts of the centre are broken off half an inch, I should hesitate about it. As soon as they are broken at the top or bottom to any degree they begin to make a larger surface for the pin to spring out, and break worse until they break out entirely.

Mr. MARDEN (Fitchburg): As soon as I received a copy of the order issued by Mr. Buchanan, I immediately issued a similar order on the line of our road, and notified the connecting roads that we would not receive a vertical coupler with any defects in the knuckle, and that order was to be positive; we are substantially carrying it out to-day. As to how much of a defect ought to condemn the knuckle I think depends upon what part of the knuckle is broken or cracked, very largely. We have them come to us with defects of various kinds; the different kinds of metal that are used in the construction of the head give very different results as to breakages. We have them offered to us cracked partly across on the upper side of the knuckle. That is said to be due, to a great extent, to the fact that the drawbar or hook instead of going out straight on a line with the car is sagged a little, or perhaps not up in place, and many times the connecting drawbar or hook on the opposite car will strike on the upper side of the knuckle. There are so many different defects in a knuckle that it would be very difficult to issue orders covering every kind of defect, and I think we should have to leave it largely to the judgment of the inspectors to determine what constitutes a defective knuckle. There are certain plain defects which might be described and prohibited, but perhaps the best kind of order to issue would be to direct the inspectors not to receive them if broken at all. As regards the question offered for discussion to-night, I must say that I should be entirely unable to form any code of rules to govern the receiving of defective knuckles, unless it should be the order we have already issued.

Mr. CHAMBERLAIN (Boston & Maine): I am somewhat surprised that our friend Adams contemplates the issue of instructions under which he would take a defective knuckle. Before this famous (by some called infamous) circular to which reference has been made was issued Mr. Adams and I got together and tried to agree upon what we would take in the way of a defective coupler. We looked at a car in East Boston belonging to the New York Central road, which uses several kinds of bars, and examined the bars in that car. We saw a very slight crack in one, and Mr. Adams said he would be willing to take that bar; I thought so myself. I then got up and looked through the pin-hole, and found the knuckle was ready to fall apart. I think many cars come in in that way, with the bars cracked, and you can't tell how far the crack extends without uncoupling the cars. Our greatest trouble has been from our connection with the New York, New Haven & Hartford. About the 25th of October we had tied up at Northampton 40 cars with cracked knuckles, some missing knuckles, and some broken bars, and in two weeks more there were 60 cars tied up with the same defects. We finally agreed that when a connecting line offers a defective automatic coupler and has not material to repair it with, we will take the car with a common bar, providing the car is carded for wrong drawbar. If defective or missing knuckles are offered, we receive them if the coupler is safe to run, providing the car is carded for defective vertical plane drawbar; but we will not receive it if carded only for broken, cracked or missing knuckles. We will not receive cars with defects of any kind and then card them.

From Oct. 15 to Dec. 31 we have either rejected or had rejected, or found broken on our line, 632 vertical plane couplers broken in various ways. Not having the material to replace the bars, we put into these cars the common bar, and carded them for the same—broken vertical plane drawbars. These defects were divided as fol-

lows: Cracked knuckles, 165; broken knuckles, 154; missing knuckles, 85; common bars in place of vertical plane bars, 41; defects of vertical plane bars where the knuckle was all right, 54; defects other than those noted, 136. The Boston & Maine had two of these hook couplers, and broke one. Did not buy any more. Taking the past experience of the roads, I don't see how they can afford to receive cars with broken or cracked knuckles. A small defect in a knuckle leads to a larger one.

Mr. BUTLER (New York, Providence & Boston): We have had considerable trouble with vertical plane couplers on our road; we get them with all kinds of defects. We have so far refused to receive them. I am not in favor of taking any middle ground. I do not see how we could establish any rules to govern inspectors, and under any rules there would be difference of opinion among inspectors as to what to pass. So many different kinds of draw bars are used, it is pretty hard to tell how much merit there is in this coupler. I would not receive any car with a defective coupler.

Mr. ROBERTSON (Central Vermont): The Central Vermont has suffered seriously from this defective knuckle business. I am sorry to say for the manufacturers of the knuckles that I have found very miserable stock put into them—blow-holes in malleable iron—and I have almost mistrusted that I have found some cast-iron knuckles, and my confidence in the vertical type coupler is about gone. I did at one time think it was better than the link-and-pin coupler, even with the Safford improvement, but my experience with it has not confirmed that opinion. I don't think we should receive knuckles damaged in any way. I would say, if you get a car with a defective knuckle, let it stand, and send to the road that owns the car for the knuckle or draw bar, and when you get it put it in.

Mr. CHAMBERLAIN: One of our connecting roads offered us two cars with cracked knuckles, and we refused to take them. They hung the cars up for three or four days, and then offered them to us again, with new knuckles nicely fitted in, apparently all right, and we broke both of them before we got the cars out of the yard. We traced those knuckles right to a cast-iron foundry, a good many miles from any malleable iron foundry, too. In taking our connecting line inspector to task for that, he said he examined those couplers, and thought they were probably made of cast iron, and in fact he supposed they were all made of cast iron.

Mr. LAUDER (Old Colony): I believe that Mr. Butler struck the key-note when he said he would not receive any car with a defective coupler. The only safety lies in having the drawbar thoroughly inspected, and if there are any defects in it the car should be rejected. . . . It is an old truism that the way to get a bad law repealed is to strictly enforce it. I believe the only way that the railroads of this country can get clear of this vertical plane coupler is to strictly enforce those rules that were first promulgated by the New York Central road—to refuse to receive cars with vertical plane couplers unless in perfect order. If that is done all over the country the life of the vertical plane coupler will be exceedingly short. So long as the mechanical men, who are responsible for the transmission in proper shape from one point to another, busy themselves with making rules governing the receiving of cars with defective vertical plane couplers, and the work is being fairly done, and there is no particular detention of cars, the managers may not realize the large expense to which their roads are put on account of this coupler. If every defective coupler or drawbar caused the stoppage of the car until the owner was notified and until he furnished a new knuckle or drawbar, the matter would come to the attention of the managers, and they might be surprised that the detentions were so often caused by this so-called Master Car Builders' coupler. This coupler has been foisted upon the roads by the mechanical papers, not only by advertising, but by procuring the writing of editorials, to make the managers believe that the so-called Master Car Builders' coupler was a panacea for all the ills we are troubled with in the interchange of cars. I do not refer to our friend Sinclair (who I see is present) nor to his paper in making this statement.

The experience of the last two years has proved that the most dangerous thing on our roads is this coupler, and I trust that some organized effort will be made toward rescinding the action taken by the Master Car Builders' Association some years ago—action taken honestly, because they thought that type of coupler held out something better than we had before. I think the unprejudiced men at the head of the mechanical departments of the railroads of this country would almost unanimously, were it not for their pride, condemn that coupler. Of course a man does not like to admit that he has made a mistake. That coupler, in my judgment, has got to be abandoned, because of its danger; danger of breaking apart and giving out on the road, and especially danger to trainmen using it; it is the most dangerous appliance they have to handle. That is largely due to the fact that it has to couple with a variety of couplers. . . . Mr. Lauder, in expressing his objections to the vertical hook coupler, has expressed my views exactly. We have taken pains to get the cost to the Boston & Albany for three months in maintaining the vertical hook coupler; that is, the cost of repairing couplers for the three months of October, November and December. The different couplers are numbered, as we have them classified on our books. No. 249 has cost in broken bars and broken knuckles to maintain, $639.81; No. 248 has cost $2,168.68; No. 333 has cost $1,334.30; No. 334 has cost $222.25; No. 255 has cost $80.85; unknown (that is, couplers reported and the name not given), cost $144; making a total on our line of road of $4,389.89 for keeping up the couplers for three months. It will cost four times that for a year, and no road can afford to pay any such money for repairing their couplers. We are making our own knuckles, and I believe we make a better knuckle and with better steel than most of the manufacturers, and we know that we are giving the other roads as good or better than we break.

Mr. LUCIAN BARNES (Barnes Car Coupler): If a stranger from Russia had come into this room to-night, I think he would have said, though entirely ignorant of the subject under discussion, that it was somewhat one-sided. Mr. Adams has produced figures of the cost of replacing the vertical plane coupler. I think the debit and credit sides of the account should both be shown. I am a coupler man, and should like to say a word on the other side. Mr. Adams paid out certain moneys during October, November and December for broken knuckles and drawbars, etc. Then another gentleman says they are using cast iron couplers; another that there is a variation of three or four inches in the height of the drawbar. I would like to ask if this coupler has ever had a fair trial. You are going on, continually adding to the weight of your cars and engines; everything has to be made stronger. If those couplers are not strong enough, let us make them stronger. A prominent railroad man told me he was more than pleased with a certain line of verticalplane couplers he had been running; running by themselves with air brakes, he said the breakage was nothing. You cannot educate your trainmen in a moment. There are places to teach men the use of the air brake; why should not they be taught how to use the vertical plane coupler? I think it has not had a fair chance. This coupler has been voted by the Master Car Builders as the right thing, and if it is not strong enough to keep pace with the 30-ton cars and the mogul engine, when you make up your account, don't say the vertical plane coupler costs so much unless you put down what it would cost you to run your train with the link-and-pin coupler.

Mr. GRIGGS (N. Y. & N. E.): We are very short of links and pins, and the vertical hook coupler is one great cause. We may receive 10 or 15 cars, one from one direction, and others from other places, and we have got to couple them up, and have to furnish the links and pins to do it. If I had my way, I would not take a car with a vertical hook coupler with any defect whatever; and still further, if I had my way, I would not take one if it was perfect.

Mr. ADAMS: Mr. Barnes has referred to links and pins. It cost us during the year 1890 $6,375 for links and pins.

Mr. MARDEN: I was somewhat surprised at the demand for links and pins at three of our western terminals. I sent to inquire, and they said there was an average of 50 to 60 links required per week, and which we had to furnish, on account of the use of vertical hook couplers; and I could readily see where they would come in. I hope that it will not be understood that the New England roads in opposing the vertical hook coupler are not progressive. I don't believe there is a railroad man who would not be glad to see a different form of coupler from the link and pin, and only one form of coupler in use on all our cars. We are perhaps put into as bad a position with the vertical hook coupler as with the link-and-pin coupler, as to variety of forms. I believe the time will come when we shall have a uniform coupler, with all its parts interchangeable, the same as the Westinghouse air brake is to-day. I believe the link-and-pin coupler is more safe than and economical than the vertical hook.

Mr. ADAMS: Before we adjourn I would suggest that it might be well to have an expression of opinion on the part of the members of the club, or the railroad men anyway, as to whether the order issued by Mr. Buchanan should be changed, or strictly adhered to. If it be the sense of the members that that order should be adopted and adhered to, I move that they so express it.

The motion was unanimously carried.

Annual Meeting, American Society of Civil Engineers

The annual meeting of the American Society of Civil Engineers began Wednesday morning, Jan. 21, in New York. The President, Mr. Wm. P. Shinn, was in the chair, and about 125 members were present.

Tellers were appointed to canvass the ballots for officers, viz., J. E. Dagron, J. B. Johnson and J. G. Van Horne. The result of the election was not announced until six o'clock p. m. It was as follows: 711 votes cast; elected:

President, Octave Chanute.
Vice-Presidents, Alphonse Fteley, Charles Hermany.
Secretary, Francis Collingwood.
Treasurer, John Bogart.
Directors, Rudolph Hering, Clemens Herschel, E. P. North, Samuel Whinery, Charles B. Brush.

The usual reports of officers were made. The total membership is 1,366, a net increase of 120 for the year.

The Norman medal was awarded to Mr. James R Freeman for a paper on "Experiments Relating to the Hydraulics of Fire Streams," and the Rowland prize to Messrs. Octave Chanute, John F. Wallace and W. H. Breithaupt for the paper on the Sibley Bridge.

The report of the Committee on Revision of the Constitution presented the constitution as revised, which was accepted for discussion. This was taken up section by section and the consideration of it occupied the entire day. The most important changes made from the Committee's draft were: To allow service as professor of engineering at a reputable college to count as time spent in active practice, as qualifying for membership; adding to the Nominating Committee the five past Presidents, whose terms have most recently expired; and striking out this clause "Vice-Presidents, ex-Vice-Presidents, Directors and ex-Directors only shall be eligible for the office of President, and Directors and ex-Directors only for the office of Vice-President." That notwithstanding the long and careful discussion the changes were so few indicates the care with which the Committee had done its work.

At the evening session further committee reports were made and Mr. J. F. O'Rourke gave a lecture on the Chignecto Ship Railroad.

As we go to press Thursday noon we shall not hazard a report of the doings of that day, having before us the fate of an esteemed contemporary which, under like circumstances, reported a programme that did not come off

Notes on French Locomotives and their Every-Day Working.

BY CHARLES R. KING.

II.

This sketch of some standard French locomotives is continued from the *Railrood Gazette* of Jan. 16, page 41.

PARIS-ORLEANS.

Fig. 6 shows the standard express locomotive of the Paris & Orleans Company. The principal dimensions are:

Cylinders, 17 × 25½ in.
Wheels (drivers), 80 in.
Heating surfaces (fire box, 112 sq. ft.), 1,532 sq. ft.
Grate area, 16¼ sq. ft.
Weight on drivers, 56,320 lbs.
Boiler pressure, 127 lbs.

In service these engines can haul trains of 280 tons at 31 miles per hour. The latest engines are greatly increased in power, but the design remains the same. There is now a dome of 35 in. diameter behind the chimney, and another on the fire box, connected by a pipe passing along over the top of the safety valve and sand dome. The first dome takes the dry pipe and regulator, and has a lever safety valve. The chimney is

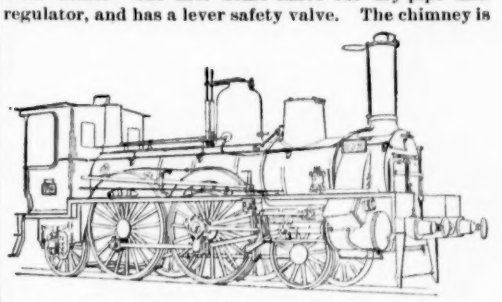


Fig. 6.—Standard Express—Paris-Orleans.

hinged and turns back, just clearing the dome; this is to facilitate the cleaning of the variable exhaust nozzle. Sand is ejected by a double archimedean worm screw operated from the foot plate. The ash pan is made so that the bottom can be lifted up to clear snow-drifts on the road in the winter.

Differing from the ordinary type, illustrated, the new engines have cylinders inside the frames 17½ in. × 27⅝ in., driving wheels 7 ft. in diam., heating surface 1,470 sq. ft., grate area 22 sq. ft., and boiler carries 182 lbs. pressure. They are equal to hauling 246 tons at 46 miles per hour. The boiler has an extra tube plate supporting the tubes about the middle, and it is carried above water level to oppose the forward movement of the water in sudden halts.

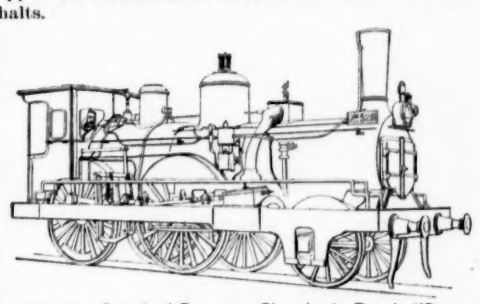


Fig. 7.—Standard Express—Chemin de Fer de l'Est.

CHEMIN DE FER DE L'EST.

The Chemin de fer de l'Est has practically but one type of express engine, and this is shown by fig. 7. In general appearance they remind one of Austrian locomotives, and this is probably due to their having been generally built in Austria by the Wiemer-Neustadt Société. They differ from any other type of French locomotive by a plate frame outside of the outside cylinders, and in miner details they present many distinguishing features. Mr. L. Regray (now M. Salomon), Chief Engineer, designed them in 1873, and they appear to be very satisfactory to the road. True, there are also two or three Cramptons taking the light trains out from Paris, and one of these will probably become the precedent of a class of engine unique to the world, but built upon the most approved principles. This Crampton has its boiler filled up entirely with tubes, and another "boiler" mounted above that for the steam. This overcomes the difficulty of large diameter boilers between high driving wheels. Until the appearance of the newly planned engines there will be no locomotives with bogie trucks on this line. One engine was noted with extension smoke box, but this form is not approved. There are nothing but six-wheelers for working the heaviest coal trains. The engines are built at the company's shops at Epernay.

The principal dimensions are:

Cylinders, 17 in. × 24 in.
Drivers, 82⅝ in.
Driving axles between centres, 8 ft. 2 in.
Boiler diameter, 49 in.
Tubes (13 ft. 5 in. long), 178 in number
Heating surfaces (fire box, 98 sq. ft.), 1,241 sq. ft.
Grate area, 25 sq. ft.
Pressure, 140 lbs.
Weight, empty, 43 tons.
" on connected wheels (when loaded), 14½ tons.
Mean tractive effort, 4 tons.
Extreme width between outside frames, 9 ft.

The cabs have ventilated elevated roofs and no smoke stops in the interior. Cylinder oilers, exhaust pipe regulator and compressed air brake valve are fitted as on other lines.

Of their actual running it may be said that on the Paris-Belfort section they cover 277 miles at 40 miles per hour, inclusive of some four or five stops. On the same section, between Troyes and Paris (103½ miles), the total time is 2 hours 15 minutes—an average of 46 miles per hour running time, there being one stop of 5 minutes. The 48 miles between Troyes and Longueville alone is done in one hour. On a falling grade near Paris the writer has checked 62 miles per hour with a train that has been delayed.

The fuel is generally briquettes and dust, put in every 10 to 13 minutes, and the blower helps matters with firemen who are indifferent to the coal premium. Without reckoning the engine, the consumption is 0.46 lbs. per ton per mile, or 0.25 lbs. for the gross load, at which rate a 150-ton train would reach 37 lbs. per mile, or rather over the general average of French expresses, whose rates

(*Continued on Page 66.*)

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

At the last meeting of the New England Railroad Club the link-and-pin men had their innings. There was the usual lack of exact figures and consequently the discussion adds nothing to what we already know of the service life and cost of maintenance of the M. C. B. coupler. Mr. Adams' figures are of no value. We understand him to say that repairs to vertical plane couplers cost the Boston & Albany $4,390 in three months. The report that comes to us is not precise on this point and may be that was the cost for all couplers, but from the context it probably covers vertical plane couplers only. But what does that prove? What is the use of presenting such figures? It is impossible to even guess at the number of couplers represented. The cost of repairs per car per year distributed among all the equipment from which these couplers were drawn may have been very great or very small. Again, there may have been included in these couplers a good deal of that defective material of which some of the members spoke. If Mr. Adams thinks that his company cannot afford to pay out so much money for maintenance of couplers, why does he not get the coupler makers to maintain them for him at a fixed annual price per car? We venture to say that some of them would do it at a less sum than he now pays for the maintenance of link-and-pin couplers. One of his statements was that links and pins cost the B. & A. $6,375 in 1890. This also is a vague statement, as we do not know the number of cars that it applies to, but on the basis of the freight equipment of the road at the end of last June this item of links and pins alone, leaving out drawbars, would amount to 95 cents a car a year.

One speaker said that he had found "very miserable stock" in some of the vertical plane couplers, and indeed he suspected that he had found some cast iron knuckles. Another speaker confirmed this circumstantially, having "traced two knuckles to a cast iron foundry." This is nothing against the M. C. B. coupler, but it again illustrates the folly of some of the makers in sending out bad material. We have often had occasion to speak of this matter and could point out some flagrant instances of excessive breakages in large lots of couplers, from bad stock. Of course all such lots are counted in the aggregate and go to swell the total of breakages when one comes to look into the service records to get the life and cost of the coupler. It is one of the misfortunes of the type that it has been so abused by some of those who have the greatest interest in its success. This evil may be easily met by requiring the makers to make good all breakages due to defective material, which some of them, at least, now do regularly. Meanwhile it is no more just to charge this bad material against the *type* than it is to condemn it because one coupler parted a few weeks ago 22 times in a journey of 400 miles. That coupler had a bad lock, but there are plenty of good locks in the market, and one must use sense in selecting a coupler as well as in buying any other machine.

The sum of the discussion is that the New England Club, so far as it is represented by those present, is unanimously in favor of the order issued last October by several Eastern roads, that no car with a broken vertical plane coupler, or broken or missing knuckle, shall be received, even if it is carded. Further, the sentiment of the Club, as expressed by the speakers, is against the vertical plane coupler. Several of them did not commit themselves on this point, but those who did were decidedly against it. We will give them credit for being honest in their opinions, which apparently is more than some of them, at least, are willing to do for the other side. Mr. Lauder, for instance, said: "This coupler [the M. C. B.] has been foisted upon the roads by the mechanical papers, not only by advertising, but by procuring the writing of editorials." This we take as an unconscious tribute to the influence of the technical press. We had modestly believed that a very important part of the "foisting" had been done by those railroad officers who organized and conducted tests and researches, and labored patiently to disentangle from the 3,000 or 4,000 designs the type and the individual of that type which most nearly filled the many requirements of the best coupler. We do not believe that our genial and fluent friend Lauder would have said on second thought what he did say when he was under the spell of his own eloquence. We shall not suggest that link-and-pin men have ever even tried to "procure" support among railroad officers; but we will say that the only coupler men who have ever tried, by offers of stock or advertising, or other consideration, to influence the editorial opinions of the *Railroad Gazette* have been link-and-pin men. What luck they have had our readers can judge. If Mr. Lauder will reflect a little he will understand that the moment the editorial columns of a technical paper cease to reflect the honest and disinterested opinions of the editor, and those opinions alone, from that moment they cease to be worth purchase. The editor of a technical journal is like a professional gambler in this respect, that he must keep a "square game" to have any lasting success. That plain business proposition is a first rate foundation for morality.

Messrs. G. M. Bogue and H. B. Stone, who were selected to arbitrate the dressed beef controversy, have decided that the lines north of Lake Ontario should charge 2½ cents per 100 lbs. less than the lines south of the lake, this on the assumption that the rate paid for car service is the same by all lines. This would seem to be a substantial victory for the Canadian lines. As our readers will remember, the compromise fixed up two months ago settled one important branch of the question in admitting that the Canadian Pacific should receive the same differential as the Grand Trunk. The temporary rate since that time has been the same by all lines, the differential taking the form, substantially, of a rebate; that is, practically all the cars in which the beef was carried belonged to the shippers, and the mileage paid by the roads for the use of these cars was 1 cent a mile by the Montreal roads, and ¾ cent by the others. This was on a rough estimate that the ¼ cent difference equaled 2 cents per 100 lbs. on the average carload. This, however, is a very crude computation, as will be seen by a glance at the distances by the respective roads. The distance from Chicago to Boston and return by way of the Grand Trunk is a little over 3,000 miles, and by way of the Canadian Pacific nearly 3,100 miles. The average may be called 3,050. By the Lake Shore, New York Central and Boston & Albany it is 2,074. Thus it will be seen that a Chicago shipper sending by the shorter route gets about $15 for the use of his car, while by the longer line, at the higher rate, he gets about $30. To be sure, his car suffers more wear and tear in making the longer journey, but the time is not much greater, and the shipper is therefore likely to look exclusively on the gross amount received. The differential which has been granted during the past few months is therefore greater than it seemed. Even with a ¾-cent rate by all roads the cars making trips via Montreal will earn about $7 more than those going by the direct route, so that the actual differential henceforth will be even larger than the nominal one—3 cents—in force before the fight began. The $7 difference in car service is equal to about 3 cents per 100 lbs. on top of the 2½ cents differential. The acceptance of the arbitrators' award by the roads is not yet announced, but the Canadian lines certainly ought to be satisfied. Assuming the maintenance of the present 45 cent rate by the short lines, the long lines will get about 39½ cents per 100 lbs., equal to a trifle over five mills per ton per mile for carrying freight which is accompanied by a large percentage of ice (carried free) eastward, and which involves the constant hauling of exceptionally heavy empty cars westward. The high speed at which this freight must be carried is an incidental enhancement of the expense which may be thrown in for good measure. If this is not getting rid of money fast enough they had better throw a few bags of gold into the St. Lawrence River.

The *Financial Chronicle* has some elaborate figures of gross earnings for the year 1890. A table comprising 153 roads for the full year and 47 roads for 11 months shows gross earnings for 1890 of $922,000,000 as compared with $852,000,000 in 1889, an increase of $70,000,000. The mileage of these roads increased 2,800 miles. This increase in gross earnings is fairly well distributed over the whole country; the southern roads gained $8,000,000, the southwestern $5,000,000, the trunk lines reporting increased $3,000,000 and the roads in the middle western states about $4,000,000.

During the week the advance in prices of securities has been fairly well maintained, and sales of stocks and bonds still continue good. Leading stocks like Atchison, Missouri Pacific, the Grangers and Lake Shore, show fractional losses in quotations. There seems no doubt that speculative buying has been checked by the passage through the Senate of the free coinage bill. On the subject of silver and the effect of any silver legislation upon prices there are the most diverse opinions. An influential portion of the financial men are of the opinion that attempts to force upon the country a silver standard below the present gold one is practical dishonesty, and must result in more or less demoralization of business. Others think that the country is on so sound a basis that a little silver will not hurt us seriously. The latter point out that few ill effects have come from the Bland bill compelling the coining of silver dollars, and argue that the evils of any reasonable silver bill may be easily overrated. It seems impossible to foresee the future, because much depends upon the shape which the silver bill will finally take. Our business connections with European countries having a gold standard are very close and must continue so. The evil of excessive silver will first make itself felt in a double standard of value, one for London and one for New York or Chicago; but the extent of this is largely conjecture.

The Constitution of the American Society of Civil Engineers

It will be remembered that the appointment of a committee to revise the constitution of the American Society of Civil Engineers arose out of the desire of many of the more ardent members of the Society for such changes in the constitution as would make the Society more truly national in its character, as they thought, and admit of affiliation with the numerous local associations of civil engineers existing and organizing in all the considerable cities of America.

The radicals, who hoped that any such measures would be recommended, will find themselves greatly disappointed. The Committee made a brave beginning by codifying the old constitution and by-laws, which were in a rambling disorder. In giving the Society this old bread in a new-shaped loaf to chew upon, it really seemed to every one that something important had been accomplished.

The action of the Committee results in the following changes proposed in the old constitution, so far as they are worth mentioning. Two new grades of membership are to be created, advancing the better juniors to be associate members, with voting powers; and a class of subscribers, to let those members of outside clubs and societies, who are consumed with a desire to attach themselves to the American Society, enjoy this distinction upon payment of an annual fee of $10. It should be noted, as an indication of the reluctance with which this concession is made, that whereas the provisions as to the other classes of members are mandatory, that as to subscribers is only permissory, reading, "there may also be admitted to association with the society as subscribers." That is what might be called extending the left hand of fellowship.

The Article on Admissions is improved by requiring applicants to give references to members, instead of securing indorsers; and all except corporate members are to be admitted by action of the Board of Directors, after having notified the membership of the applications received.

The number of officers is to be much increased; a

President, four Vice-Presidents, 18 directors, with all the living Past Presidents who continue members, are to constitute the Board of Direction, instead of the compact and serviceable body which has administered the affairs of the Society in the past. There are to be two secretaries, one for ornament and one for use; an auditor, and there is to be an annual examination of accounts by an expert. It is probable that the provision for two secretaries, one to be elected by the Society and to give what time he can afford to the Society's affairs, while the assistant secretary, to be appointed by the Board, is to give his entire time to his duties, was intended to adapt the constitution to the state of things which has existed, rather than to the one about to come into being.

The number of the members of the Nominating Committee is increased to seven, which will only make it more difficult to get an acceptable ticket, we think; for the efficiency of a committee varies inversely as the square of the number composing it, as a general rule. The Society voted in the annual meeting to make the Nominating Committee still larger by taking in five Past Presidents.

There is an entirely new article, very timidly proposed, for separate ballot, which provides for branches of the Society to be organized by those who are already members of the Society, at points where the Board judge the membership is sufficiently large to warrant a local organization, and the papers of such branch and discussions upon them *may be printed* in the Transactions of the American Society, which is "as far as it is wise for the Society to move in that direction at the present time," in the opinion of all but one of the committee.

We have the greatest respect for the members of this committee, and, possibly, all the more because of their well-known conservatism and dignity of character; yet, inasmuch as the principal object of those who asked for any amendment of the old constitution was that it might provide a *modus vivendi et adfiliendi* with the existing outside engineering societies, we must express our disappointment and declare this report, as to this object, an impotent conclusion.

The Latest Michigan Central Compound.

In another column will be found an illustration and description of the Michigan Central compound locomotive built by the Schenectady Locomotive Works. Our readers are all familiar with the compound engine first built for the Michigan Central. It was shown in the *Railroad Gazette* Jan. 31, 1890. The later locomotive differs in important particulars from the first.

The most important difference is in the increase of diameter of the driving wheels; the next is a decided improvement in the boiler, which now has an extended wagon top and radial stays instead of crown bars, as in the former construction. There is a slight increase in weight, about 8,200 lbs., for the whole engine, and of 2,000 lbs. on the drivers; also an increase in wheel base of 1 ft. and 4 in. total, and of 11 in. in driving wheel base.

The value of the change in the boiler is considerable. The number of tubes is increased from 247 to 272, and the length from 12 to 13 feet. The fire box area is also increased, resulting in a heating surface of 1,992 sq. ft. instead of 1,670, as in the first engine, meanwhile retaining the same diameter of boiler. The increase in heating surface alone points to a much greater economy, but, in addition to this, the use of radial stays instead of crown bars, as well as the largely augmented steam space, promise for this locomotive an economy in operation that is seldom realized.

The increase in the diameter of the driving wheels from 68 in. to 74 in. will change, perhaps, considerably the difficulties incident to the use of a slide valve gear on a high speed engine. The reduction in the number of revolutions per minute must make itself manifest on the indicator cards by a reduction in wire drawing and back pressure; also there will be less difficulty in counterbalancing the reciprocating parts and the engine will be easier on the track.

The extremely large inside clearance on the high-pressure valve, namely, one-half inch, will surprise many, as for years only the boldest constructors have attempted to do better than leave the valve "line and line" on the inside. In all high-speed locomotives inside clearance is, in point of fact, a necessity; but just how much can be used without interfering with the economical operation of the engine it is impossible to state. However, it is beyond all question that one-half inch is too much for a low-speed engine, and yet it may be necessitated for high-speed engines by the difficulties with the valve gear, which have already been found with compounds at such speeds. One-half inch clearance will not be found too great when the locomotive is moving at considerable speed, and we like the courage of those who are willing to try it for regular work.

As a whole, this engine is deserving of the best attention that can be given it by those interested in the subject, and it is to be hoped that we shall be able before the next convention to place before our readers the results of carefully conducted experiments with it, as we believe that such results would go far to settle the value of the compound engine for general railroad use.

The Latest Rapid Transit Schemes.

In devising plans for rapid transit in New York City the only promise of an absolute solution of the difficulty is in those schemes which cut loose from makeshifts and are unhampered by any close relation to the existing systems. Moreover, the complete solution must not only provide for handling the traffic within the city limits, but for receiving passengers from, and delivering them to, all the railroads of the surrounding country. It must admit of running fast and heavy express trains as well as light local trains, and in fact it should include the means of handling through as well as local business, both passenger and freight. It will be said that this is mixing two or three distinct problems; but the system which does not take them all into account is not complete. From time to time such radical plans are brought forward. One was proposed three years ago by Mr. Heman Clark, and was described in the *Railroad Gazette* of Feb. 17, 1888. A similar measure is now proposed by Mr. Austin Corbin, who is associated in the scheme with a number of men eminent in finance and business, among whom are B. F. Tracy, General John Newton, Abram S. Hewitt, Vice-President Morton, Calvin S. Brice, General Horace Porter and C. P. Huntington.

Briefly, the plan of this company provides for a tunnel excavated in the solid rock at a depth of 110 ft. or more below the surface and large enough to accommodate two tracks of standard gauge. Hydraulic lifts will provide means of communication with the surface at suitable points along the route. It is proposed to build the tunnel in sections, the first of which will connect Atlantic avenue, in Brooklyn, with the foot of Whitehall street, in New York. Later, this section will be extended under Battery Park and the North River to a point in Jersey City. Eventually the line would be carried from the foot of Whitehall street underneath Broadway to Union Square, thence beneath Broadway and the Boulevard to Van Cortlandt Park, where it forms a loop, and returns to the Battery, via Third avenue. Two connecting lines are provided for, one following the course of the Harlem River and another joining the two main tunnels near Union Square. A third line also is carried along the North River from the Battery to Seventy-second street. The immediate plans, however, contemplate building only the section between Whitehall street and Atlantic avenue. This system will use some method of electric propulsion as being best adapted to subterranean railroading.

In the plan proposed by Mr. Clark the line starting at Fleetwood Park extended the length of the island to a point near the Post-office, and there divided, one branch passing under the East River to Flatbush, and the other passing under the North River and coming to the surface in the meadows beyond Bergen Heights, in New Jersey.

Simultaneously with the Corbin scheme is brought forward another, almost as bold in its conception. The Henning rapid transit system, under the direction of B. S. Henning, has also enlisted the interest of several prominent men. The route proposed for this system is substantially the same as that just described, and the construction is likewise subterranean. But instead of a level roadway, the Henning system consists of a series of inclines sloping by equal gradients in both directions from each station on the route. The stations being at the surface, trains will descend the inclines by gravity, attaining sufficient speed in the descent to carry them over the intervening section of level track to the foot of the next incline, and thence part way up the slope. On the inclines will be cables running at the rate of 15 miles an hour, and these will serve to carry the train to the summit and give it a start down the next grade. This is not by any means a new principle, but its application upon so large a scale is unprecedented.

It may be said of the Henning system that, while it does not so completely avoid the complications due to interference with sewers, water and gas pipes and other underground institutions, it has the advantage of bringing its passengers to the surface without elevators.

The two great obstacles to rapid transit are the excessive cost of real estate in New York City and the fact that the city stands on an island. The deep tunnel scheme avoids both these difficulties and opens up immense possibilities. Passengers from the surface roads of all the surrounding country, New York, Connecticut, Long Island and New Jersey, could be delivered, without transfer, at city stations within five minute's walk of their destinations. Freight could be loaded and discharged in the heart of the city, while through trains, both passenger and freight, could be run from New England and Long Island directly to the western and southern lines. Mr. Corbin's favorite scheme for a passenger and mail port at the east end of Long Island and a line to Milford Haven is a logical sequence of the same scheme. By such a line the time from New York to London could be easily reduced 24 hours.

But this development of the tunnel plan would require more than two tracks. A double track tunnel across the North River would be entirely inadequate to handle the present suburban traffic, to say nothing of through passenger and freight business. Indeed, an adequate rapid transit service within the city limits alone, cannot be secured by a double track line. There should be space in at least one of the tunnels up and down the island for a third track. A complete development of the tunnel scheme would demand at least three if not four tracks in all of the tunnels. But it may be found that it would be cheaper to build several parallel, single-track tunnels than to make one of sufficient dimensions for four, or even for two, tracks. Single-track tunnels would be easier to ventilate, and it might be found advantageous to place them above one another rather than alongside. This was done with portions of the London subway.

Subterranean yards for terminals for the lines in the city could be avoided by circulating the trains carrying only the city traffic up one tunnel and down another. Otherwise extremely costly yards for switching would be needed, and in either case there would be a great deal of non-paying train mileage, because the traffic between the Battery and Harlem is immensely more dense than that which would cross the rivers and in those hours when the up traffic is dense the down traffic is thin.

Again, the complete development of the tunnel project can only be realized when a more efficient underground motor is made than any which is yet known.

A system of viaducts through the blocks, on right of way, bought and condemned, connecting with bridges across the rivers, is the only alternative which can compare with this vast tunnel scheme, and has some advantages over it. But we do not believe that anybody has yet gathered the data for an accurate comparison of the cost and revenue of the two plans.

More than usual interest has been drawn in the last year to the question of car lighting. The investigations of several of the large roads have led to radical changes, substituting gas for kerosene lamps; and gas has been put into many Pullman and Wagner coaches as well. We do not hear, however, of much progress in electric lighting. When we consider the sums that are spent in upholstery and decorations that add nothing to comfort, health or safety, and the comparative indifference to those really important matters, we are reminded of Herbert Spencer's generalization that "in order of time decoration precedes dress." The evolution of the railroad car goes on in the same barbaric way as the evolution of dress. Every sign that florid decoration is being made second to utility is a sign of real progress. Perhaps the introduction of gas will be hastened by the fact that many of the later designs of gas lamps have been made highly decorative. One would suppose that every railroad officer would wish to get rid of a lighting apparatus so dirty, bad-smelling and hard to keep in order as a kerosene lamp. If it gave adequate light it would have more friends, but as a matter of fact it is notoriously inadequate, especially on sleeping cars. Day coaches run in suburban traffic, even where kerosene lamps are still used, are, as a rule, better lighted than the most magnificent "Pullmans" in which one must often pass long evenings in dismal splendor. All this is aside from the question of safety. We have made a hasty examination of the *Railroad Gazette* record of train accidents for the last three years. We have not gone back to 1887, which year was marked by some terrible fires. We find recorded in that time 26 cases in which passenger trains have been in whole or in part destroyed by fire, and in four of those cases the fire is reported to have started from kerosene lamps. In many of the other cases the origin of the fire was uncertain; in some of them, it may have been a lamp, and probably was. It is not likely that all such fires have been made public; in fact, we heard of a recent one that never got into print. Some of these cases have been attended with loss of life and all of them with considerable loss of property, and they serve to point out the necessity of a safer light for all classes of cars that run in passenger service.

The prosecution of offenses under the Interstate Commerce Law is again under way, the agents of the Com-

mission having been engaged during the past week in presenting cases before the federal grand jury, now in session at St. Paul. The matter of obtaining evidence in this connection has again been brought to the attention of the courts. Mr. W. W. Finley, Chairman of the Western Passenger Association, was subpœnaed to attend before the grand jury with official records of his office in respect to transactions which it was proposed to investigate. Some of the matters in question were such that the roads desired to have the facts fully presented in order to justify their conduct, which they believe to have been in accordance with the law. This is understood to be the position taken by the Chicago, St. Paul & Kansas City concerning the sale of a large block of tickets to a broker during the rate war of last spring. In the other cases, the counsel for the roads took the position that Mr. Finley could not be called upon to testify as proposed, and the matter was submitted to the court. Two or three hearings were had, which were however, informal, and rather took the shape of a consultation between the district attorney, the counsel of the roads and the judges of the court than a regular formal proceeding. The final result of the matter was an intimation from the circuit and district judges, sitting together, that it was a question of grave doubt whether the chairman of an association, situated as Mr. Finley is, should be compelled to disclose admissions and facts obtained in the course of his employment and duties as such chairman. The district attorney accepted this view and discharged Mr. Finley from further attendance before the grand jury. Considerable other evidence concerning alleged violations of the Interstate Commerce law was presented, but it is not yet known what indictments, if any, have been found.

A bill has been introduced in Congress by Representative Flower, at the instance of Professor Egleston, of Columbia College, delegate from the American Society of Civil Engineers, to legalize throughout the United States the adoption of standard time as used by the railroads. The authorities of any state, city, town or village may adopt the time of the 75th, 90th, 105th or 120th meridian, as may be most convenient, and such standard, after adoption, shall be legal and recognized by the courts. There is also a provision legalizing the 24-hour notation. The press dispatches state that the passage of this bill is asked for on diplomatic reasons, the International Congress held in 1884 having taken up the subject for the whole world; but the enactment of such a law would seem to be not only sensible but highly desirable aside from any foreign relations, especially as the use of the four railroad standards has now become so firmly established as to place this nation in a position where it can lead rather than follow in any international scheme bearing on this subject. The proposed law calls the 75th meridian "No. 17," the 90th "No. 18," etc., according to the plan of numbering, which begins at the anti-meridian (that on the opposite side of the earth from Greenwich, and counts westward.

Six dispatchers and about 30 conductors of the Chicago & Erie have struck on account of the dismissal of a dispatcher, C. C. Scott, of Huntington, Ind., who gave a meeting order, which only by good fortune failed to produce a collision. As we go to press, General Manager Tucker says that freight trains are temporarily suspended, and that Scott will never be reinstated as long as he (Tucker) lives. Another statement says that the striking dispatchers' places have all been filled. It appears that the negligent dispatcher made the blunder a month or two ago and was then suspended. He is a prominent member of a brotherhood, and it was reported that the company at that time yielded to a small strike of dispatchers, making some sort of an agreement to reinstate Scott. The character and terms of this agreement are not reported, but the tenor of the above reported remark of the General Manager indicates that the position taken by the company will be strenuously adhered to.

NEW PUBLICATIONS.

Graphical Analysis of Roof Trusses. By Charles E. Greene, Professor of Civil Engineering, University of Michigan. Revised edition. New York: John Wiley & Sons, 1890. Octavo, cloth, pages ix, 80, with three plates.

This book is Part I. of the author's well-known work on trusses and arches. It was first published as a series of articles in an engineering periodical, and in 1876 was issued in book form. The type of the present edition has been set up anew and the plates redrawn, thus giving the opportunity to arrange material in a more systematic order and to introduce some additional problems. The author's experience in teaching the subject has undoubtedly led to improvement in many matters of detail; for instance, we notice that the word reaction is used instead of the awkward term "supporting force" employed in the first edition. There is given a method, which has been used for several years in the author's class room, for the solution of ambiguous cases that will often be found useful. This is based on the principle that if any diagonal of a quadrilateral be reversed, the only stresses affected will be those in the members which make up the quadrilateral. This principle can also be applied, as has been done by other authors, to the investigation of stresses caused by initial tension in diagonals.

While graphical methods for the analysis of stresses are important and valuable, they are becoming less so, it appears to us, every year. The graphical process furnishes checks upon the work, it clearly sets forth the relations of the stresses in the several members to each other, and it saves mental exertion. A beginner in telegraphy may find it advantageous in some respects to have the message recorded upon a strip of paper, but if he have any natural ability for becoming an operator he soon abandons it for the ear method. So while graphical analyses are important for a beginner, they become less and less so as his knowledge and proficiency increase. When unusual and complex problems arise, graphical methods have their true field of application, and hence it is important that they be taught in schools, even though their use in practice is not extensive. Roof trusses furnish the opportunity to set forth one of the most beautiful of the graphic processes for determining stresses, and among the many books on the subject this may safely be said to be one of the best, being clear, concise and well adapted to the use of students. In the concluding chapter the properties of the equilibrium polygon are explained and applied to the determination of the resisting moment of cross-sections of beams.

Index to the Transactions of the American Society of Civil Engineers. Volumes I. to XXI., inclusive. By John Bogart, Mem. Am. Soc. C. E. New York: Published by the Society, 1890.

For some reason or other no general index to the papers published by the American Society of Civil Engineers has ever before been printed, and as a result a great body of extremely important engineering literature has been practically useless to most members of the profession. The index now issued covers the Transactions from the beginning of the Society to the end of 1889. It comprises 272 pages, printed in type large enough to be comfortably read. It is a simple alphabetical index of subjects and writers, with many cross references.

Transactions of the Canadian Society of Civil Engineers, Vol. IV., Part I., January to June, 1890. H. T. Bovey, M. A., Secretary, Montreal, Canada.

This issue contains, in addition to the report of the annual general meeting and the President's address, the following papers: "One of the Oldest Railroads in Canada," H. S. Poole; "Stand-Pipes," R. S. Lea; "The Screening of Soft Coal," J. S. McLennan; "The Manufacture of Natural Cement," M. J. Butler; "Columns," C. F. Findlay; "Irrigation in British Columbia," E. Mohun; "The Sault Ste. Marie Bridge," G. H. Massy; "Generation, Distribution, and Measurement of Electricity for Light and Power," A. J. Lawson. The last-named article is profusely illustrated, and the frontispiece is a handsome portrait of Col. C. S. Gzowski, A. D. C., President of the Society in 1889.

The Transit is a semi-annual publication by the State University of Iowa, edited by the engineering society of that institution. Volume I, No. 2, issued in December, contains information relating to the University, and gives the names of the board of regents, faculty, officers and members of the engineering society. It also contains in full the papers read before the society, the titles of which are as follows: Cement Tests; Hydraulic Cements and Cement; Preservation of Timber; A Simple Method of Determining Latitude; Paving Brick and Brick Pavements, and an editorial setting forth the advantages of the institution.

Annual Report of the United States Commissioner of Patents for 1889. This is the centennial report of the Patent Office of the United States, and it is interesting to note the rapid growth of invention under the care of this department. In 1790 the number of patents issued was three. During the first 50 years the number amounted to 12,421. During the century 428,622 patents were issued and in 1890 alone the number was nearly 24,000. Of these last 72 were for car brakes and 393 for car couplers.

The Washington Bridge. A Description of its Construction. By William R. Hutton, Chief Engineer. New York: Leo von Rosenberg, 35 Broadway. Price $8.

In a recent issue, announcing this work as in preparation, we have given a sufficient description of its contents. There are 96 pages, quarto, of the text, 26 albertypes and 37 double and single page lithographs, making it not only a valuable contribution to engineering literature, but a magnificent volume.

Journal of the Association of Engineering Societies. December, 1890.

This number contains papers on "The Water Supply of Small Cities," "The State and the Railroads," the "Muir Glacier in Alaska," and the "Evolution of the Elevator."

TRADE CATALOGUES.

The Hall Signal Co., 50 Broadway, New York. This company has issued a leaflet which may be regarded as a supplement to its larger catalogue, recently circulated, which describes three of the company's special devices. These are: 1. The electric semaphore, which is similar in principle and operation to the company's well known disc signal, the electromagnet being employed to raise and lower an arm instead of a disc. 2. The Stewart-Hall train-order signal, a combination of the Hall outdoor signal with electromagnets and circuit breakers in the telegraph office to provide against blunders in delivering train orders. These chapters are supplemented by a diagram of the eight-mile section of New York Central track that is equipped with the Hall automatic block system, accompanied by a reprint of the description of the same which was published in the *Railroad Gazette* of Dec. 5 last. This description is accompanied by handsome half-tone reproductions of photographs 5½ × 7½ in., showing the appearance of the signals as erected on the line of the New York Central and, incidentally, some fine Hudson River scenery.

The Lackawanna Lubricating Co. has issued a circular describing its cylinder lubricator and grease cup, shown in the *Railroad Gazette* Nov. 15, 1889. This lubricator is very compact in form, and is well described in the circular. The offices of the company are at 41 Coal Exchange, Scranton, Pa.

Notes on French Locomotives and their Every-Day Working.

(*Continued from Page 63.*)

vary 9 to 11 kilogrammes per kilometre for the lightest to the heaviest of express trains 300 tons total load.

WESTERN OF FRANCE.

This line, the most familiar to Americans, has a sort of engine that appears antiquated, more from its fittings—big bell, capped chimney and square domes—than anything else. It is only recently that the design has been very markedly altered from the old existing patterns.

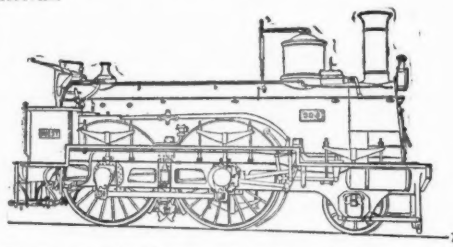

Fig. 8.—Standard Express—Chemin de Fer de l'Ouest.

The engine illustrated (fig. 8), built by Neilson & Co. (England), is of a powerful class fashioned on the old lines. The oldest type have the rear driving axle in front of the fire box and the cylinders are advanced several inches before the smoke box to get the requisite length of connecting rod. This firm and Sharp, Stewart & Co. have built a large number for the line and many of them have a single transverse spring carrying the weight on the front wheels. Later engines have a transverse suspension lever pivoted between the pair of leading wheels. Many have steel fire boxes and copper tube plate forward. The boilers are mounted higher than those with outside cylinders on the Southern lines. By the following leading dimensions it will be noted that the machines are not intended for very heavy work, although these figures belong to engines of augmented power.

Cylinders, 17 in. × 23½ in.
Drivers, 78½ in.
Diameter of boiler, 47 in.
Tubes (12 ft. 7 in. long), 166 in number.
Heating surfaces (fire box, 76 sq. ft.), 1,156 sq. ft.
Pressure, 127 lbs.
Weight, empty, 37½ tons.
Weight on driving wheels (medium load), 29½ tons.

Fire boxes on this line are in some cases fitted with brich arches. Firing is done by no means frequently, but the box is generally kept full and the fine coal comes back in showers from the chimney, so much so that the engineer's hat brim holds an appreciable quantity. But, for convenience, these ill-protected foot plates are better than the cramped decks of other engines. With the two "crack" engines having four-wheel trucks, steam reverse gear and deep cabs it is different. On these the fireman is noticeably embarrassed by the boxes that are fixed on either side of the gangway.

During the past summer these sister engines have done service between Paris and Le Mans on the Brest section, hauling trains of only eight cars, including a "saloon," over a crooked track (near Paris at least abounding in gradients from 1 in 200 to 1 in 120. No good opportunity was had to observe their economy. Only 31 lbs. of coal are used per mile with the thinnest of fires in a large box fitted with a brick arch. As the coal is put in systematically there is very little lost by smoke. Under these conditions the regulator is never opened more than half-way to one-third, and pressure seldom drops more than 30 lbs. from the normal 160 lbs. Chartres to Paris, including one stop at Versailles, is timed at 41 miles per hour, average; distance, 54 miles. The longest distance running between Paris and Rouen (87 miles) is provided for by tenders of 10 metres cube capacity per water. Sotteville (near Rouen) is the site of the principal stops, those at Paris being intended chiefly for repairs and reconstructions. It is here one finds model sleeping berths, etc., provided for the convenience of the runners.

PARIS, LYONS & MEDITERRANEAN.

The illustration fig. 9 is from a machine known as the 1878 model, upon which lines later engines have been built with only minor differences, saving, of course, the new compounds. The principal difference is that the valve chests are placed inside frames instead of at an angle outside, the Allan straight link gear remaining as shown; driving wheels reduced to 78½ in. diameter; fire

box shell raised above boiler and lengthened also; heating surfaces increased to 1,533 sq. ft., grate area to 23½ sq. ft., and weight empty to 50½ tons. These increased

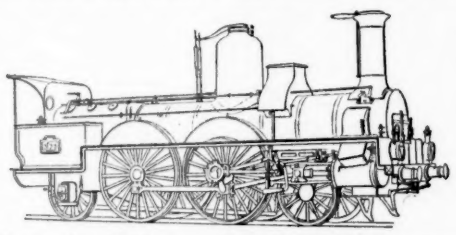

Fig. 9.—Standard Express—Paris, Lyons & Mediterranean.

figures give a better idea of the present power than those which follow and belonging to the type illustrated

Cylinders, 19½ in. × 25½ in.
Driving wheels, 82½ in.
" " between centres, 86 in.
Boiler diameter, 48 in.
Tubes (16 ft. 2 in. long), 161 in number.
Heating surfaces (fire box, 96 sq. ft.), 1,447 sq. ft.
Grate area, 22 sq. ft.
Pressure, 140 lbs.
Weight, empty, 47 tons.
" on driving wheels (load on), 30 tons.

Six-wheeled tenders carry 8,800 lbs. coal and 13 tons water. Coal consumption varies between 37 and 38½ lbs. per mile, according to the train loads. Of the later engines, Sharp & Co. (England) have built a number. It is interesting to note that the P. L. M. believes thoroughly in outside cylinders and working parts; an engineer said that, excepting the compound, they had no inside cylinder machines.

Although the principal shops are situated at Oullins, those of the company at Paris are the most interesting the writer has noted. The smithy has an exceptionally large number of steam hammers up to 4,400 lbs., or overhead travelers for 66,000 lbs. are liberally provided, and the machine shop is a perfect model of its kind—the greatest order prevailing everywhere, and instead of the murky light of most such departments the machinists have been well cared for in the first designing of the place. One finds a highly finished duplicate of every tool, gauge and template in the glass cases back of the shop. The power is derived principally from engines of the double inclined, marine type, built in 1858, doing excellent service, and kept so that they are veritable adornments at the ends of the long buildings. Adjoining the boiler shop is seen the annealing furnace for steel boiler plates and the rolling mill and in the wheel shop the hydraulic presses and appliances for withdrawing wheels from the tires when the latter are set in a frame on the floor surrounded by gas jets. The copper and brass workers' shop is set apart. The tubes are brass, as is the boiler sheathing, which is considered the most economical. The sheathing is painted nevertheless, only the bands remaining bright. The locomotives are certainly a credit to the line in their orderly keeping. Order prevails everywhere. Repairs and construction, although in adjoining buildings, are kept rigidly distinct. The administration is probably an expensive one, red-tape of steel mesh is evident, and visitors are carefully conducted through the works in a guarded manner.

TECHNICAL.

Manufacturing and Business.

Mr. Frank Bakeman has resigned as General Agent of the Hinson Car Coupler Co., and is succeeded by Mr. J. E. Forsyth. Mr. Bakeman has secured a large interest in the American Powder Co., of which he is President and Treasurer. This company controls the manufacture and sale of emmensite, which, it is expected, will be adopted by our government for ordnance and naval purposes. It also controls in the United States the manufacture and sale of lithotrite, the Belgian substitute for common blasting powder, and it is hoped that this will largely replace that article for coal mining purposes. Emmensite is a substitute for the nitro-glycerine compounds, to which class belong all the dynamites.

The Berlin Iron Bridge Co. has just completed the iron roof over the new casting shop of the Montgomery Iron Co., at Port Kennedy, Pa.

In constructing the proposed dam across the Colorado River at Austin, Tex., Bernard Corrigan, the contractor, will use the largest "Locke-Miller" cableway ever built. The main cable is of crucible steel, 1,850 ft. long, 2½ in. in diameter. The whole plant was designed and furnished by the Lidgerwood Manufacturing Co., 96 Liberty street, New York City.

Thomas Morton, manufacturer of copper and steel sash chains, has issued a revised price list, dated Jan. 1, which contains good descriptions and numerous illustrations of the different forms of this chain. Offices are at 63 to 65 Elizabeth street, New York City.

E. Thiele, 78 William street, New York City, has sent out a two-page folio, showing the relative merits of Portland and other cements. It contains a condensation of various cement tests which have been made recently, and shows the value of different cements after a period of 7, 28 and 100 days.

The Kansas City Car & Wheel Works has ceased operations indefinitely. The Kansas City works is a branch of the St. Louis Car & Wheel Works.

The Laidlaw & Dunn Co., of Cincinnati, O., have purchased the entire property of the Eclipse Pump Manufacturing Co., including patents, stock and machinery.

The Rail Market.

Steel Rails.—The agreement among the manufacturers is now in a fair way to succeed. The plan tentatively adopted at a meeting of the representatives in New York this week does not attempt to formally regulate the orders which the different mills may accept. But each company is allotted a certain percentage of the sales, and an accounting will be taken each month. The mills exceeding their quota will pay a penalty on each ton of orders exceeding their percentage. The association reports the total shipments of rails in 1890 at 1,388,186 gross tons. The production of the Allegheny mill would probably bring the amount to 1,475,000 tons. The western mills made 911,000 tons and the eastern 564,000 tons. The quotations at New York are $29@$30; at Chicago the mills are idle, and the market at Pittsburgh is also depressed.

Old Rails.—Quotations are: New York, $21.50@$23 for foreign rails; and at Chicago $23 for old iron rails and $18.50 and below for old steel rails.

Contract Prices of German Freight Cars.

Concerning the award of contracts by the Imperial Railroad Direction in Cologne, the following awards for freight cars of increased capacity have been made. Offers were as follows:

Box cars, with air brake, from $650 to $700 each.
Box cars, without air brakes, from $500 to $525 each.
There were no foreign offers on this item.
Open box cars, with air brakes, from $550 to $600 per car.
Belgian offers were about the same.
Open box cars, without air brakes, $475 to $500 each.
Belgian offers about the same.
Coke cars, with air brakes, $580 to $600 each.
Coke cars, without air brakes, $480 to $500 each.
Iron coal cars, with air brakes, $560 to $600 each.
Iron coal cars, without air brakes, $435 to $460 each.

The capacity of the last two items, viz., coke and coal cars, was to be for 15 tons, therefore a trifle stronger.

The prices furnished are throughout lower than they were in February of last year, which proves that material in the main has become reduced in value. Considering the prices of Belgian offers, it appears, if one takes into consideration the lower price of labor in Belgium, that the materials comprising these cars have gone up in cost in that country.

Steel Cars.

The Steel Car Company, of New York, and Wilcox Building, Denver, Col., has issued a prospectus setting forth the objects and purposes of the company together with facts and figures showing the large number of deaths resulting from the use of wooden cars. It also treats of the economic considerations in favor of the steel passenger and freight cars. The list of accidents is very complete, and the cuts showing the details of the same are extremely interesting, being well prepared and accompanied by a description. Among other conclusions at the end of the prospectus, which has 48 pages, is the following: "The steel car can be depended upon to continue to carry the load of its rated capacity, whereas the wooden car soon loses its original strength by the exposures to changes in weather, shock, etc., and is either re-rated or the cause of serious delays and wrecks, besides the cost of repairs on account of being overloaded, while the life of steel cars will be longer, the weight less, the capacity greater, and the expense for repairs comparatively nominal. The cost will not be in excess of the better class of high capacity wooden cars."

The Reading Rolling Mill.

On Tuesday of this week a party of 300 gentlemen, composed of representative men in different sections of the country, inspected the works of the Reading Rolling Mill Co., at Reading, Pa.

The original buildings of this plant were erected in 1867 by the Philadelphia & Reading Railroad Company, for a rail mill, and they were run for this purpose a number of years. In November, 1889, Messrs. Cofrode & Saylor, of the Philadelphia Bridge Works, secured possession of the plant, and organized the Reading Rolling Mill Company. Extensive changes and improvements in the works were begun in November, 1889, and on March 12, 1890, the company made its first finished bar of iron. The mill is equipped with the most approved machinery and appliances. The machines are systematically arranged, and with the labor-saving devices introduced afford unusual facilities for handling heavy products from one department to the other throughout the mill. The arrangements for weighing, inspecting and marking the finished articles and loading upon cars for shipment are also very complete. The mill originally contained 12 single puddling furnaces, 10 heating furnaces and three trains of 23-in. rolls, the mill being adapted solely to the manufacture of iron rails. This machinery was in a perfect state of preservation, but the position of the furnaces and the style of the machines were such that the plant was totally unfitted for the manufacture of structural shapes of iron which the new proprietors are to manufacture, and they immediately commenced changing the machinery to accomplish their end. The single furnaces were changed to double, draft was put in instead of blast and new puddling mills added, increasing the total capacity of the puddling department from 24 to 75 tons a day. The furnaces were torn down and re-erected in positions to afford greater room, particularly for the rolling of very long bars. Under the old arrangement rails could be rolled only to 30 ft. in length, whereas the finished train now introduced is adapted to the rolling of angles and other shapes as long as 80 ft. A new extension has also been added to the mill 90 ft. long in which has been erected a new 14-in. train for the manufacture of splice bars and other small shapes. The plant includes 40 acres of inclosed ground.

The main building, in which is the heating department, is 500 ft. long, and the puddling wing 200 ft. long by 90 ft. wide. The new puddling mill is 90 × 107 ft., and the cold finish wing 90 × 90 ft. The motive power for the machinery consists of 19 stationary engines ranging from 50 to 1,000 H. P., and aggregating over 4,000 H. P. The aggregate product of the finishing mills will be about 1,200 tons per week. Each mill is also equipped with a large straightening press and angle straightening rolls. In the main building there are the usual revolving saws for cutting iron when it is hot, but there is a separate building in the yard which contains a circular saw for cutting cold bars, which is 54 in. in diameter, and makes 4,000 revolutions per minute. In another building there is a massive double angle shears which is with one exception the largest shears in the United States. The company at present employs 425 men. The officers of the company are: Francis H. Saylor, President; Joseph H. Cofrode, Vice-President; William Brazier, Superintendent. W. H. Lutz has entire charge of the raw and finished stock. J. L. Rake is the office manager.

Launching a French Torpedo Boat.

Le Génie Civil illustrates and describes the launching of one of seven torpedo boats built and, in part, in course of construction for the French navy by the Société des Anciens Etablissements Cail, of Paris. The boats have a length of 35 metres (about 115 ft.), and are equipped with compound condensing engines of 500 H. P. and locomotive boilers. The launching was effected by transporting the boat, mounted on two cradle trucks, to a large steam traveling crane capable of lifting 40 tons. By means of two slings supported by an iron girder hung from the crane hook, the boat, which in its unfinished state weighed only 18 tons, was lifted clear and easily lowered into the water. The whole operation took only seven minutes. The boilers and machinery were subsequently lowered into the vessel by the same means.

Free Instruction in Highway Construction.

The Engineering Department of Vanderbilt University, Nashville, Tenn., continues its offer of precious years to admit *free of charge* to a class in road engineering one principal or deputy highway commissioner or other official, or if no official, then a private individual from each county in Tennessee. The appointment shall be made by the Chairman of the County Court, on or before Jan. 15, 1891, and must set forth that the candidate is in a position to be of benefit to the public road system of the county wherein he resides.

If in a county no applicant apply for appointment before Jan 15, the Chairman of the County Court shall, until Feb 1, 1891, have the privilege of appointing one similarly qualified applicant from any other county, or from any state.

The course of instruction will extend from Feb. 1 till April 1, and will consist of lectures and work on the economical location of highways to conform to conditions of topography and traffic; principles of construction of new, and of reconstruction of old roads, and of maintenance *versus* repairs, methods of drainage; simple highway structures, retaining walls, drains, culverts, simple bridges; practice in field-sketching, simple platting and draughting, instrumental location, and computing estimates of cost; study of systems of highway administration.

Artificial Stone for Station Platforms.

Last May the Wehn Pavement Co., 18 Exchange Place, New York City, contracted with the Wisconsin Central Railway Co. to construct, in the new Grand Central passenger station at Chicago, all the platforms of its "Lithogen" artificial stone and to pave the carriageway with the same material. The platforms are four in number, each 558 ft. long and 19 ft. wide; in addition all the spaces between the rails are concreted by the Wehn company, and graded to catch basins, giving to the entire interior of the train shed a handsome and uniform appearance. This construction is not only durable but it can be kept absolutely clean, because the entire space can be flushed with water. This is not a new departure in platforms, but the use of the "Lithogen" stone for street paving will attract attention, not only because of its novelty but in its bearing upon the question of the best material for street paving. The carriage drive is 146 ft. long and 117 ft. wide. The surface of the pavement is indented, so that it resembles the Belgian pavement, giving a sure footing for horses. The Wehn Pavement Co. guarantees this pavement to remain in perfect condition for a term of years.

The company also reports having constructed during the year station platforms at Alliance, O., and at Fort Wayne, Ind. These platforms are handsome, clean, durable and, in some situations, more economical than wood. This pavement is equally well adapted for floors for railroad shops, roundhouses, etc.

A Large Petroleum Tank in Norway.

The firm of A. Hiorth has built a good-sized petroleum tank at Steilene in the Christiania Firth. It is intended for Russian petroleum, and the erection of another, and somewhat larger, for American petroleum is under contemplation. The installations are on two islands. The tank is built by the Nyland Engineering Company, and has a diameter of 60 ft. 4 in. and a height of 33 ft. 7 in., with a capacity of 576,700 gallons. Outside the tank are glass gauge tubes with graduated nickel plates underneath, so that the level of the petroleum in the tank can always be ascertained. The plates used for the tank have at the bottom a thickness of ⅝ in. and at the top of half that thickness. The roofing is of wood covered with iron plate. The filling takes place through a 6-in. iron pipe by direct pumping from the tank steamer. The length of this pipe is about 180 ft., and the tank rests on brick pillars. From the tank a 4-in. pipe, for the discharge of the petroleum, goes to a store house, with a smaller tank of about 200 casks capacity. By a special appliance the petroleum is always drawn from the top, so as to get it clear. From the small tank are led off several smaller pipes, so that four casks can be filled at the same time. The store house is 170 ft. long and 60 ft. broad, and has also accommodation for coopers, painters, etc. At a distance of about 100 yards from the store house is a building with a boiler, from which a pipe goes to the store house for the warming of glue, etc. The tank can be filled with petroleum in some six or seven hours.—*Engineering.*

The Sharpneck Roller Bearing.

Wheeler & Odell, licensees of the Sharpneck Roller Bearing, Chicago, have issued a circular letter, signed by H. F. Royce, General Superintendent of the Chicago Rock Island & Pacific lines east of the Missouri River, which gives results of practical experience with the roller bearing. The following are quotations from the letter: "Recent experiments conducted on our road under my direction show in favor of the Sharpneck Box a saving of over 33⅓ per cent. of coal, and all the oil, waste, and attention. Further and more complete experiments, under better conditions, for securing competi tive trial will, in my opinion, give increased saving of fuel over figures given above."

Cement Packing for Manhole Covers.

Cement packing for manhole covers for boilers has been proposed and used with satisfactory results by J. Meyer, of Celle, Germany. Portland cement was used, being mixed with water to the consistency of a stiff paste. This was evenly spread over the seating edges of the manhole cover, and also over its seat proper in the boiler, the surfaces having first been well cleaned and moistened. Some dry cement was then sprinkled over the paste, after which the cover was carefully set in place and fastened.

Storage Batteries for Street Cars.

Electric storage batteries for street car traction are about to be used on several lines at Paris, France, two companies having recently made trials which appear to have given satisfactory results. They are the French Electric Accumulator Company and the Société pour le Travail Electrique des Métaux.

The Monier System of Bridges on Austrian Railroads.

The Monier system of concrete arch construction provides for the use of iron lattice work, buried in the concrete, and consisting essentially of round iron bars arranged parallel and transversely to the axis of the arch. A short time ago a bridge, built on this principle, was tested at Matzleinsdorf, near Vienna, Austria, with very satisfactory results with respect to carrying

capacity. In consequence of this the Southern Railroad of Austria now proposes to build a number of such bridges at street crossings. A beginning has already been made at the station Mödling, where a Monier bridge, with three spans of about 33 ft. each, is now in course of construction. The thickness of the arches will be about 6 in. at the crown and 12 in. at the abutments. The width of the bridge roadway will be about 26 ft. As to the cost, it is stated that while the estimated cost of an iron bridge at this point was about $30,000, the cost of the Monier bridge will probably not exceed $10,000, thus showing an appreciable saving in the adoption of the system. While, for the present, it is regarded as specially applicable to street bridges, it is thought likely that, with some further experience, it may be successfully adopted in railroad bridge construction also.

Rail Profile Apparatus.

Schilling's profile measuring apparatus for rails, illustrated and described in the *Railroad Gazette* a short time ago, is said to be in use on several German and Russian railroads, and to give entire satisfaction. The device, as may be remembered, gives an exact diagram of the section of the rail to which it is applied, and enables a ready determination of the amount of wear of the rail head.

THE SCRAP HEAP.

Notes.

The Pennsylvania Railroad has officially dropped the "h" from the word Pittsburgh.

The Grand Jury at Camden, N. J., has indicted Dennis McCloskey, the Gloucester saloon-keeper, for attempting to wreck a train on the Camden, Gloucester & Mount Ephraim Railroad a few weeks ago.

A press dispatch states that the telegraph operators of the New York, Chicago & St. Louis west of Cleveland have received an advance of pay, averaging $5 per month, in response to a request presented several weeks ago.

The division officers of the Philadelphia & Reading are examining their dispatchers, station agents, operators, engineers, conductors and brakemen on the train rules. It is said that each man who successfully passes is given a certificate.

The Chicago, Milwaukee & St. Paul has established in Chicago a bureau of information, for the purpose of disseminating industrial data East to manufacturers who intend locating in the West. This is done with the view of developing the territory through which the line runs.

The Cincinnati, Wabash & Michigan has issued an order directing strict compliance with the law requiring bulletins to be posted at all stations giving the number of minutes which passenger trains are late. The company has been prosecuted in the courts and the validity of the law affirmed.

The Chairman of the Commercial Travelers' Association appeared before the House Committee on Commerce in Washington this week, to urge a favorable report on a bill to permit railroads to give reduced rates to commercial travelers and carry an extra amount of baggage for them free. The committee authorized Mr. Mason to report favorably a bill of the kind desired.

Cable dispatches have had something to say about the strike of the railroad employés in Scotland nearly every day during the past week, but have conveyed no very definite information. The railroad managers claim that their business is running smoothly and is improving, while the reporters persist in saying that there is still a stubborn fight in progress. On Saturday last a procession of trade unionists in Edinburgh, got up to show sympathy with the strikers, is said to have contained 30,000 men.

The threatened strike of station operators on the Chicago, Milwaukee & St. Paul appears to have been practically a failure. The officers of the road state that only about 75 men out of 500 sent in their resignations on Jan. 16, the time announced, and that these places were promptly filled. The chief trouble seems to have been on the Council Bluffs division. Two stations in Iowa were shut up because the townspeople refused to furnish food or lodgings for the new men sent by the company to take the place of strikers.

There being a lull in traffic on the Big Four lines, it becomes necessary to reduce the number of employés, and in doing so the management has adopted rather a new policy. The division superintendents are to carefully look the field over and in dropping men select those who are the least reliable and competent. Especially is the question of the men's sobriety to cut an important figure. If an employé is known to be addicted to drinking intoxicating liquor when off duty he (as well as those who drink when on duty) is likely to receive one of the earliest notices that the company will not need his services longer.—*Indianapolis Journal.*

Foreign Notes.

After much discussion of the subject, it has finally been concluded on at least one of the German railroads to partially roof over what now represents the cabs on its locomotives, and to provide seats for the engineers and firemen.

According to an account from Milan, the National Bank of Italy is actively interested in the organization of an Italian steamship company for East Africa. The capital of the company is to be 20,000,000 francs (about $4,000,000), and its immediate object will be to connect the Somali and Zanzibar coasts by a line of Italian steamers, so as to be independent of English enterprise.

The Warsaw-Vienna Railroad Company, at Warsaw, Russia, has offered prizes for competitive designs for a new station at that city. There are to be prizes of 3,000, 2,000 and 1,000 roubles for the best three designs, respectively, and three additional prizes of 500 roubles each for three designs next in the order of merit. Detailed information can be obtained by addressing the company at Warsaw.

A recent petition to the German government, in the interest of curtailing Sunday work in the postal, telegraph and railroad services in the German empire, has elicited several official explanations to the effect that Sunday work in these departments has already been reduced to the minimum consistent with efficiency and safety of operation. While the desirability of stopping work on Sunday is admitted, it is maintained that in the railroad service, at any rate, a further extension of Sunday rest is scarcely possible without disregarding general traffic interests.

Traffic on German Waterways.

A late number of *Kuhlow's* notices a government compilation of the statistics of the traffic passing some principal points on the German inland waterways, from which we learn that for 1889, crossing the Dutch frontier by the Rhine, 2.8 million tons of goods went up the river and 2.6 tons came down, besides 32,000 tons of raft wood. About 15,000 vessels cleared in and out. The principal articles of import were, grains, 32.5 per cent.; iron ores, 17.4 per cent.; besides pig-iron and petroleum; 62.6 per cent. of the exports was coal, besides stone, wrought iron and different kinds of earths. This trade has increased greatly since 1875, when only 0.8 million tons came in and 1.6 million tons went out.

At Mannheim, the staple place for goods sent from the lower Rhine to South Germany and Austria, 1.6 million tons of goods went up the river, consisting principally of coal, grain, flour, petroleum and other oils, iron and cement, and 0.5 million tons came down, with the additions of 116,000 tons of raft wood. At Schandau about 2 million tons of merchandise and 360,000 tons of raft wood came down the Elbe from Bohemia and only 229,000 tons of goods went up.

Of the traffic on the Spree, only that to Berlin is given, which was up the river, 2.8 million tons of merchandise, with 4,000 tons of raft wood, while 1.6 million tons and 7,000 tons of raft wood went down the river from Berlin. The articles brought into that city by water are divided as follows by weight: Stone, 71.6 per cent.; fuel, 8.2 per cent.; means of subsistence, 9.6 per cent.; wood for building, 6.4 per cent., and merchandise, 4.2 per cent.

Attention! Literary Railroaders.

The company mentioned in the following item suggests that we shall be doing an important public service by disseminating knowledge of the offer it makes:

"The Michigan Railway Supply Co., of Detroit, Mich., manufacturers of the 'Central' steel brake beam, makes the following novel proposition to master car builders and superintendents of motive power and machinery. It offers three prizes, as follows, viz.: $100 for the first, $50 for the second, and $25 for the third best article, stating why its 'Central' steel brake beam is the best metal brake beam in the market. The award of the prizes will be left to a committee of railroad supply men present at the M. C. B. convention, held at Cape May, next June.

"The firm also offers a reward of $50 to any one master car builder or superintendent of rolling stock and machinery who will first deliver at its works in Detroit, Mich., one of the improved 'Central' steel brake beams (of which there are nearly 100,000 in use) that has given out and been rendered useless, any time within the past two years, through any weakness of construction or defect in workmanship."

New York Railroad Men's Anniversary.

The fifteenth anniversary of the railroad branch of the Young Men's Christian Association was celebrated at the "Railroad Men's Building," 361 Madison avenue, New York City, on Jan. 13. Cornelius Vanderbilt, who gave the men this building and who is Chairman of the Board of Managers, said in his address:

"During the year just closed a greater number of men have been interested in the success of the work carried on here, and the influence exerted through the various departments has been wider and deeper than in any other year. Our efforts here are but a part of an important work for railroad men extending over a large section of our country. Ninety-five such branches as this are now in existence. The total cost of maintaining them is $140,000 per annum, and of this large sum the men themselves give between one third and one-fourth, the remainder being contributed by railroad companies. Fourteen of the branches own buildings of their own, valued at over $84,000, and at 12 other points entire buildings valued at $231,000 are set apart by railroad companies for the use of the association. Seventy-four of these branches have libraries with 51,000 volumes. At most of them numerous meetings are held, lectures given, and 62 of them report visits to sick and injured aggregating 7,852 during the year just ended."

Secretary George Warburton reported that the average daily attendance at the Madison avenue house in the past year was 373, and the average attendance for December was 449. The Seventy-second street branch was reported to be in a prosperous condition.

Russian and Siberian Railroads.

The British consular report from St. Petersburg just issued from the foreign office gives some details of Russian railroads. New lines recently opened amount to 445 miles. The whole length of Russian railroads is over 17,690 miles, and of this the government owns 4,333 miles, having in the past year acquired 1,507 miles of existing lines.

In 1887 the working expenses were reduced to 72 per cent., and in 1888 to 66.5 per cent. of the gross receipts. One-half of the leading railroads last year were worked at 52 per cent. of the gross receipts, leaving 48 per cent. as net revenue. It is hinted that the decreased expenses is at the cost of efficiency of government lines.

The most important project is the vast scheme of a Siberian trunk line, from Zlatoust, through the whole of western and eastern Siberia and the Ussuri region to Vladivostock on the Pacific coast. This projected railroad has for some time engaged the serious attention of the government, on account of its great importance in political, strategical, administrative and economic respects. Two routes have been under consideration—one passing through the northern district by way of Ufa, Omsk and Tomsk, and the other being by way of Oreuburg, Orsk and Nishmeudinsk in the south. The northern route is less direct, but was finally selected by reason of its location through a country adapted to colonization. No engineering difficulties are said to exist, the only obstacle being of a financial nature. The distance is not less than 5,000 miles, and the cost is estimated at upward of $300,000,000. Surveys are now in progress, but the question of its construction is still deliberated.

Railroad Wisdom from Blue Earth County.

In the Minnesota Legislature this week Mr. Currier, of Blue Earth County, introduced a railroad bill, drawn largely after the Iowa law. It is to regulate railroads and other common carriers, to increase the powers of the Board of Railroad Commissioners and to prevent and punish extortion and unjust discrimination. It gives to the Railroad Commissioners the right and power to fix rates after an investigation of all circumstances. Perishable freight is the only kind that may be favored in handling. Joint through rates are required, and if the railroads do not make such rates the Commissioners must do it for them. Officials failing to comply with this law are liable to a fine of from $500 to $5,000. Proceedings may be brought against any corporation on the finding of the Commissioners.

Canadian Railroad and Canal Subsidies.

The financial statement of the Dominion Minister of Finance for the year just closed, shows that on account of capital account there was expended on railroad and canal construction in Canada during the year, the following amounts: Canadian Pacific, $40,980; Intercolonial, $365,246; Digby & Annapolis, $381,942; Cape Breton, $1,170,523; Oxford & New Glasgow, $434,074; Cornwall Canal, $365,038; Culbute Canal, $2,818; Grenville Canal, $17; Lachine Canal, $7,448; Murray Canal, $106,760; St. Lawrence River & Canals, $23,979; Ste. Anne Lock, $6,151; Sault Ste Marie Canal, $176,568; Tay Canal, $22,226; Trent River navigation, $58,644; Welland Canal, $117,633; Williamsburg Canal, $139,078. The foregoing expenditure was all on account of government works. In addition to this the sum of $1,678,195 was paid out in the form of subsidies to assist in the construction of private railroad enterprises distributed as follows: Atlantic & Northwestern, $186,600; Baie des Chaleurs, $148,675; Buctouche & Moncton, $4,250; Brantford, Waterloo & Lake Erie, $36,620; Canada Atlantic, $149,812; Drummond County, $12,428; Great Northern, $20,000; Hereford County, $91,300; International, $3,840; Joggins, $9,761; Lake Temiscamingue Colonization, $26,360; Lake Erie, Essex & Detroit, $11,900; Montreal & Lake Champlain Junction, $5,400; Montreal & Sorel, $6,719; Montreal & Lake Maskinonge, $20,080; Napanee, Tamworth & Quebec, $95,744; Northern Pacific Junction, $35,000; Nova Scotia Central, $219,100; Pontiac & Renfrew, $38,440; Quebec, Montmorency & Charleviox, $65,600; St. Clair Frontier Tunnel Co., $173,000; St. Temiscouata, $74,300; Thousand Islands, $10,400, and West Ontario & Pacific, $189,200. The sum of $92,000 was also paid out on account of construction for the Kingston dry dock, $132,000 for the improvement of Port Arthur harbor, and $121,000 for improving the navigation of the St. Lawrence.

A Novel Centennial Celebration.

A circular is issued by J. Elfreth Watkins, United States National Museum, Washington, D. C., to announce that a celebration will be held at Washington in April, 1891, to commemorate the completion of the first century of the American patent system. It is proposed to commemorate "in a fitting manner the important event and place on record the nation's appreciation of the labors of those whose ingenuity, patience and tireless effort have exercised such a potent influence in accelerating the prosperous growth of the nation, and in aiding the progress of our civilization. The necessity for a National Association of Inventors organized for mutual benefit has been frequently discussed in the technical and other journals. No time could be more opportune for the formation of such an association than when men from every part of the country meet to celebrate so important an anniversary. Surely the occasion is most inspiring!

"All inventors and manufacturers and others interested are requested to co-operate with the committee in the purpose above set forth."

Somerville (N. J.) Passenger Station.

The Central of New Jersey has lately completed a handsome new stone passenger station at Somerville. Its most noticeable feature is the harmonious arrangement of color effects; the judicious use of light finishing woods, plate and frosted glass, gold lettering, and well-arranged accessories, producing a general impression which it can truthfully be said must be seen to be appreciated. The building is lit by electricity and heated by steam. The telegraph office is accessible to trainmen without their going into the waiting room. There is a porte cochère and a ladies' parlor, with fireplace, carpet and other furnishings fit for a first class hotel. The ticket office is located at the west end of the main waiting room, and is so situated, between the entrances to the parlor and the smoking room, that ticket windows open into all three rooms. The building has a second story, one of the rooms being occupied by officers of the roadway department who have their headquarters at this point and one by the station agent. The building is small, and if it had been made only one story would have appeared exceedingly flat, while as actually built it is well proportioned. The walls are of light colored Jersey sandstone from Stockton. The building was designed by Mr. F. V. Bodine, of Asbury Park, N. J., and cost, with improvement of grounds, about $16,000.

The Vestibule Patents.

At Chicago on Tuesday of this week the Pullman Palace Car Co. asked for an injunction against the Lake Shore and Michigan Central roads to restrain them from the use of the Pullman vestibule attachment, the demand being, practically, for a decision similar to that given by Judge Colt, at Boston, a few months ago, under which the devices in question were all taken off from the Wagner Palace Car Co.'s cars. Judges Gresham and Blodgett find, however, that the testimony in the Boston case differs materially from that given by the same witnesses at Chicago, and refuse to grant the injunction until a further investigation of the question whether Pullman or Sessions was the original inventor of the principal device in question. It appears that Pullman won the Boston suit on the ground that Sessions made certain inventions, and now the Chicago suit is presented in such a shape that its principal basis is the claim that Pullman's patent covers these same inventions.

Government Debt of Pacific Roads.

The Senate select committee on Pacific railroads on Tuesday last listened to arguments for modifications in the bills now before Congress looking to readjustment of the debts owed by these roads to the government. Union Pacific was represented by Jeremiah Wilson, who said that the present management found itself unable to accept the terms formerly agreed to by the company and embodied in the bill reported. Mr. Wilson said that the company would accept a proposition to refund its debt at 2½ per cent. interest, the payment to be based upon a term of 100 years, instead of three per cent. and fifty years, as proposed in the bill.

The Central Pacific was represented by Vice-President Huntington. Upon hearing Mr. Wilson's proposition he said that if more liberal terms were granted to the Union Pacific, the Central Pacific should also have the same indulgence. Inasmuch as its earnings and prospects were below those of the Union Pacific, the Central Pacific debt is to be refunded (by the proposed bill) for a a term of 100 years at two per cent. interest. If this were done he would be willing to apply part of the earnings of the Southern Pacific Railroad toward the payment of the debt of the Central Pacific.

The Illinois Central Railroad.

The following is an extract from the message of the Governor of Illinois to the Legislature:

"Under the wise provision which retained to the state an interest to the extent of seven per cent.

of the gross earnings of the road, to be paid annually into the state treasury, there has been paid to the state, all told, for the years from 1855 to 1890, inclusive, the sum of $12,365,618. Upon the $40,000,000 of capital stock of the company paid in there was paid as dividends in the same period the sum of $64,782,357, showing that an amount slightly exceeding 19 per cent. of the total paid as dividends has been turned into the state treasury; or a sum equal to 16.03 per cent. of the whole sum paid both to the state and upon stock. The last year the state's seven per cent. of gross earnings paid amounted to $486,281, and on said $40,000,000 of stock were distributed as dividends $2,400,000, the state's portion being nearly 17 per cent. of the whole amount so paid. The showing for the last six months, ending Oct. 31, 1890, gives the state as its seven per cent. of earnings $257,219, or at a rate which would make the income of the state from this source over half a million per year, exceeding in amount any other half year in the history of the road. On the whole, I think the rapid increase in the state's revenues from this source, in late years, rising as they have from $367.796 in 1885 to $486.281 in 1890, presents an encouraging prospect, and speaks well for the efficiency of the present management of the company. The further building of new competing lines of railroad having entirely ceased, there seems cause to hope for a gradual and healthy growth in the revenue of the lines in which the state will share with the owners of the stock.

A New Turkish Railroad Station.

The new station of Oriental Railroads at Constantinople was ceremoniously opened to use last November. The station is built in the Moorish style of architecture, granite, marble and brick being used. It is about 318 ft. long and 72 ft. wide. The main entrance hall is about 62 ft. high, and from it two broad corridors lead to the waiting rooms at the right and left. The latter are a little over 26 ft. in height and have a floor area of about 2,800 square feet. Each of the waiting rooms has a separate elaborately furnished apartment for the use of Turkish women. There are two station platforms, 984 ft. long, with iron roofs, for incoming and outgoing trains. The whole work was in the hands of German engineers and architects.

LOCOMOTIVE BUILDING.

Mr. R. C. Wright, of Port Richmond, S. I., is making drawings for a compound locomotive to be used on the elevated railroad of New York. His design is for a four-cylinder locomotive, the centres of the cylinders being placed in a horizontal plane, the low pressure cylinders between the high pressure. The engine will probably not exceed in weight by more than 1,000 lbs. the heaviest standard now in use on the elevated.

Three locomotives have just been turned out of the Grand Trunk shops at Point St. Charles. The driving wheels are 6 ft. 2in. in diameter. The cylinders are 18 × 24 in.

CAR BUILDING.

The 5,050 cars ordered by the Philadelphia & Reading, which we mentioned in a recent issue as to be equipped with the Van Dorston coupler and air brakes, are also to have the Butler drawbar attachment. We are informed further that the 2,000 cars recently ordered by the Lehigh Valley are to have the Butler attachment.

BRIDGE BUILDING.

Stamford, Conn.—The Berlin Iron Bridge Co., of East Berlin, Conn., is just completing a new iron and concrete bridge on Broad street, in Stamford. The bridge has two spans, 60 ft. each, with 30 ft. roadway and two 6-ft. walks. The roadway is made of iron buckle plate and concrete, with asphalt pavement.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Pennsylvania the Supreme Court rules that where in a suit to restrain a railroad company from crossing the line of another railroad, a preliminary injunction has been granted, and there is evidence to show that the desired crossing would be a dangerous one, it is proper to leave such injunction in force until final hearing on the merits.[1]

In Texas the Supreme Court decides that where a judgment is recovered against the receiver of a railroad company for injuries sustained through the negligence of his servants, the company is liable on such judgment after the discharge of the receiver, where it has received, in improvements, earnings, out of which the injured person was entitled to have his judgment paid, though he failed to establish his claim by intervening in the suit in which the receiver was appointed, as the decree ordering that the property shall be relieved from liability on claims not established by intervention in such suit does not affect him.[2]

The S. R. Co., a railway company, issued its bonds and executed a deed of trust to secure them. Defendant, another and distinct company, indorsed the bonds under a contract with the S. R. Co. and disposed of them, using the proceeds for the S. R. Co.'s benefit. Afterward defendant, having paid out of its own funds, by reason of such indorsement, $1,000,000 of interest on the bonds, and $1,000,000 for repairs and construction of the S. R. Co.'s road, had the trust deed foreclosed. The Supreme Court of the United States holds that the foreclosure was not invalid because, of the trustees in the deed, one was a director and the others stockholders in defendant company; because one person was president of both companies; because a majority of S. R. Co.'s directors were directors of defendant; because defendant's president owned most of the S. R. Co.'s stock; or because the attorneys who instituted the foreclosure suit in the name of the trustees were in other matters attorneys for or directors of defendant.[3]

Carriage of Goods and Injuries to Property.

An Arkansas statute provides that no carrier shall charge a greater sum for transporting freight than is specified in the bill of lading; and a bill of lading of goods shipped from New Orleans to Little Rock, Ark., either through the fraud or by mistake of the consignors, stated the weight of the freight to be 5,000 lbs. less than it was. The Federal Court rules that the act was not intended to give validity to stipulations which were the result of mistake or fraud. The material part of the bill of lading was the part which fixed the rate per 100 lbs., and the weight stated did not control.[4]

In Georgia the Supreme Court rules that where by statute a railroad was to pay all damages arising from the construction of the road as a condition precedent, a property owner may enjoin the construction on non-payment of damages due him, though the act provides that either party may have the damages assessed.[5]

In New Jersey the Supreme Court holds that a railroad will not be enjoined from using its main tracks for the purpose of making up trains and shifting cars on the ground of inconvenience and annoyance thereby caused one living near its track, where no abuse or negligent use of its franchise is shown, though a statute expressly provides for the condemnation of land for such purposes as part of the terminal business of a railroad company.[6]

In the Federal Court it is held that the Missouri statute of 1879, which provides that railroad companies constructing any railroad in any county of the state shall construct and maintain suitable ditches to carry off water whose flow has been obstructed by the construction of their railroads, does not apply to railroads constructed along a city street, and a railroad company constructing a ditch in said street, without municipal permission, is liable to the owners of adjoining property fordamage to the rental value thereof caused by such ditch.[7]

Injuries to Passengers, Employes and Strangers.

The Supreme Court of North Carolina rules that a railroad is not required to give a signal to passengers on board its train before starting the train from a wood station, where it has stopped to take on wood.[8]

In New York the plaintiff was injured by falling through the open space between the station platform and defendant's car; it appeared that the platform was built on a curve, so that a car touched it at a tangent. Plaintiff testified that the space between the platform and car was about 15 in.; that it admitted her shoe, about 9 in. long, without touching either heel or toe; and that she was looking at the car, and did not notice the opening until she stepped into it. One of her witnesses testified that the opening was about 15 in. more or less, but he could not say it was not 8 in. less; and another, who had been conductor on the road, said that the space was between 7 and 8 in., and did not exceed the step of a child. Three civil engineers testified for defendant that the space was from 3½ to 4 in. at the center of the car, and from 6½ to 7 at the end. The Court of Appeals holds that the railroad was not liable.[9]

In Michigan, the plaintiff in ascending the platform at defendant's depot, had her foot injured by the falling of a plank on which she was walking. The plank was unfastened, one end resting on the platform and the other on the ground. It had not been placed there by defendant, but it had been adopted by the public as well as by the station agent, because defendant had provided no step. There was a well-beaten path leading to it. The platform was from 20 to 30 in. high except at one corner, which was little used, and there it was about 16 in. high. The Supreme Court decides that defendant was liable for the injury.[10]

In Texas the conductor of a freight train, having stopped his train on one end of a bridge, climbed to the top of a box car as the train moved on, being prevented by obstructions along the track from going back to the caboose, and was knocked off and killed by a scaffold suspended over the bridge. The scaffold could have been 3 or 4 ft. higher, and the attention of the boss had been called to that fact, but he said it was high enough. It was customary and sometimes the duty of freight conductors to stand on the top of box cars when assisting in braking and signaling. A rule of the company had been furnished deceased which prohibited all persons from standing on the top of box cars while passing through bridges of that class, and from boarding trains while in motion. The Supreme Court rules that the conductor was negligent, and his representatives cannot recover damages.[11]

In New York the railroad company, having the right to run its trains over defendant's track between O. and F., subject to the rules of the defendant, sent out a special train, which was held at F. for orders. An order was sent by defendant to run the special train to O., but no notice of such order was sent to the manager of the shifting engine in defendant's yard at O., the engineer of which, on seeing the train approaching, abandoned his engine. A collision occurred, and the shifting engine went forward with increased speed and into an engine of the railroad company on which plaintiff's intestate was fireman. The Supreme Court rules that a finding that the uncontrolled condition of the shifting engine was the result of defendant's negligence was warranted.[12]

[1] Appeal of Reynoldsville & F. C. R. Co., 19 Atl. Rep., 374.
[2] Texas & P. R. Co. v. Griffin, 13 S. W. Rep., 471; R. R. Co. v. Johnson, 13 Id., 463
[3] Leavenworth County v. Chicago, R. I. & P. Ry. Co., 10 S. Ct. Rep., 708.
[4] Baird v. St. L., I. M. & S. R. Co., 41 Fed. Rep., 592.
[5] Georgia, S. & F. R. Co. v. Ray, 11 S. E. Rep., 352.
[6] Beideman v. Atlantic City R. Co., 19 Atl Rep., 731.
[7] Jackson v. C. S. F. & C., 41 Fed. Rep., 656.
[8] Malcolm v. Richmond & D. R. Co., 11 S. E. Rep., 187.
[9] Ryan v. Manhattan R. Co., 23 N. E. Rep., 1,131.
[10] Collins v. Toledo, A. A. & N. M. R. Co., 45 N. W. Rep., 178.
[11] S. A. & A. P. R. Co. v. Wallace, 13 S. W. Rep., 565.
[12] Nary v. New York, O. & W. Ry. Co., 9 N. Y. Supp., 153.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Central Pacific, 1 per cent., payable Feb. 1.
Illinois Central, semi-annual, 3 per cent. in cash, payable March 2.
Lake Erie & Western, quarterly, 1 per cent. on the preferred stock, payable Feb. 16.
Milwaukee, Lake Shore & Western, annual, 7 per cent. on the common stock and semi-annual, 3½ per cent. on the preferred stock, payable Feb. 16.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Allegheny & Kinzua, annual, Olean, N. Y., Feb. 10.
Arkansas & Louisiana, annual, Washington, Hempstead County, Ark., Jan. 28.
Bay of Quinte Railway & Navigation Co., annual, Deseronto, Ont., Feb. 2.
Camden & Atlantic, annual, Cooper Point, Camden, N. J., Feb. 26.
Chicago Belt, special, Chicago, Ill., Feb. 24, for the purpose of making a new lease with the Chicago & Western Indiana.
Chicago & Western Indiana, special, Chicago, Ill., Feb. 24, to consider proposed improvements.
Delaware, Lackawanna & Western, annual, 26 Exchange Place, New York City, Feb. 24.
Huntington & Broad Top Mountain, annual, American Life Bldg., Philadelphia, Pa., Feb. 3.
Kansas City, Memphis & Birmingham, annual, Memphis, Tenn., Feb. 4.
Kansas City, Wyandotte & Northwestern, annual, Kansas City, Mo., Feb. 4.
Kingston & Pembroke, annual, Kingston, Ont., Feb. 11.
Mobile & Ohio, annual, 11 Pine street, New York City, Jan. 28.
Northern Central, annual, Baltimore, Md., Feb. 26.
Ontario, Carbondale & Scranton, annual, Scranton, Pa., Jan. 28.
Philadelphia & Erie, annual, Philadelphia, Pa., Feb. 9.
Pittsburgh & Lake Erie, annual, 77 Fourth avenue, Pittsburgh, Pa., Jan. 27.
Pittsburgh, McKeesport & Youghiogheny, annual, Pittsburgh, Pa., Jan. 27.
St. Catharines & Niagara Central, annual, St. Catharines, Ont., Jan. 26.
Scioto Valley & New England, annual, Columbus, O., Feb. 12.
Summit Branch, annual, 233 South Fourth street, Philadelphia, Pa., Feb. 10.
Toledo & Ohio Central, special, Toledo, O., Feb. 18, to consider a proposed increase of the capital stock.
Wheeling & Lake Erie, annual, Toledo, O., Feb. 3.
Wood Mountain & Qu' Appelle, annual, Winnipeg, Man., Feb. 4.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Illinois Society of Engineers and Surveyors* will hold its sixth annual meeting at Springfield, Ill., Jan. 28-30.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1 122 Girard street, Philadelphia, on the first and third Saturday, of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the Southwest* generally holds its meetings at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7.30 p. m., on the third Saturday in each month.

The *Civil Engineers, Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

Association of Graduates—Rensselaer Polytechnic Institute.

The midwinter meeting of the alumni and former students of the Rensselaer Polytechnic Institute will be held at Kansas City, Mo., on Monday and Tuesday, Feb. 2 and 3, 1891. The entertainment committee of the Kansas City Alumni announces the following arrangements and programme. The new Coates hotel will be headquarters.

Monday, 7 p. m.: Meeting in club room, Coates hotel; 8 p. m.: Theatre party Coates opera house; 11 p. m.: Informal reception, club room, Coates hotel.

Tuesday, 10 a. m.: Visitors will meet in club room and will be escorted in special train, visiting the following places: Argentine smelting works; Quindaro waterworks; Armour Packing Co.'s establishment; 2:30 p. m.: Trip by special train over the cable railways of Kansas City; 5 p. m.: Informal call at University Club; 7:30 p. m.: Business meeting, club room, Coates hotel; 9 p. m.: Banquet, Coates hotel.

W. P. MASON,
Secy Association of Graduates.

Canadian Society of Civil Engineers.

The society held its fifth annual meeting at Montreal last week, Sir Casimir Gzowske, President, presiding. The society has seven honorary members, 277 members, 105 associate members, 74 associates and 170 students, or 633 in all. During the year 14 meetings were held. The income for the Dec. 31, 1890, amounted to $3,817.87, and the general expenditure reached $3,591.13, leaving a balance of $226.74, which together with the balance of $2,502.89, brought forward from the year 1889, gives a total balance of $2,729.63 to be carried forward.

Engineering Association of the South.

The January meeting was held in Atlanta, Ga., on the 8th inst. There were 19 members and visitors in attendance. Vice-President W. L. Dudley, of Nashville, Tenn., presided. Mr. D. W. Cooke explained a model and drawing of a proposed system of light draft tow boats proposed by him for Western rivers. The system proposed a series or train of barges, each having one convex and one concave end. The convex bow of one was intended to be fitted into the concave stern of the next boat ahead. The line of tows was proposed to be drawn by a side wheel tug at the head of the tow having the same cross-section and a concave stern like the barges.

A paper entitled "A Study of Steam Engine Pistons" was then presented by W. T. Magruder, of Vanderbilt University.

Professor Landreth submitted for informal discussion a draft of a highway bill, prepared by a committee of the Nashville Commercial Club for presentation to the State Legislature. The proposed bill comprises a state Board of Engineers, of three members appointed by the Governor, meeting quarterly, having chiefly advisory powers, but having the right to determine the qualifications of the County Engineers and the forms of records and maps by which the work of the several counties shall be recorded.

The County Court is to appoint three commissioners, who are to employ a county engineer to have direct charge of all work. Under the engineer will be district superintendents. Each superintendent will be required to give his whole time to his district. The tellers appointed to canvass the ballots for membership reported the following elections: *As Members*—George H. Crafts, Bridge Engineer, Atlanta, Ga., and Henry A. Turner, Assistant Engineer, Louisville & Nashville, Birmingham, Ala. *As Associate*—W. M. Newbold, Superintendent, Louisville & Nashville, Birmingham, Ala. *As Juniors*—R. L. Johnson, Columbus, Ga., Graduate Fellow in Engineering Department, Vanderbilt University; Thomas B. Wilson, Jr., Assistant Engineer, East Tennessee Land Co., Harriman, Tenn., and R. A. Chapman, Chief Engineer, Riverton Land Co., Sheffield, Ala.

An application for membership was received from Mr. C. J. Norwood, State Inspector of Mines for Kentucky.

Master Mechanics' Association.

The following circulars are issued:

OPERATING LOCOMOTIVES WITH DIFFERENT CREWS.

Your committee on the operating of locomotives with different crews desire the aid of your experience. Answers to any of the following questions will help us.

1. Do you run locomotives regularly with more than one crew?
2. Why do you do so, and for what reason would you abandon the practice?
3. Do you, or have you, run locomotives as near continuously as possible, without regular crews, commonly known as "pooling," or "chain-ganging"?
4. How many more engines would you need per 100 miles of track (single), if every crew had their own engine, the men not averaging over fifteen hours out of the twenty-four?
5. What do your repairs average per mile for pooled engines?
6. How do you inspect and clean pooled engines?
7. What does it cost to do work, usually done by crews, where they have a regular engine?
8. Briefly stated, what are the worst faults and the greatest advantages of the plan?
9. Do you consider the plan of double crewing engines better than pooling, and that as much service can be got out of power as by the pooling plan?

LOCOMOTIVES FOR HEAVY PASSENGER AND FREIGHT TRAIN-SERVICE.

1. Do you consider a ten-wheel engine preferable to the mogul type for heavy fast express train service? If so, why?
2. Do you consider that the pony truck is equally as safe under all circumstances and condition of track as a four-wheel truck, for fast express engines running at as high a rate of speed as 65 miles an hour?
3. What has been your experience as to flange wear on pony truck wheels of mogul engines, as compared with the truck wheels of ten-wheel engines?
4. Can you give the comparative mileage made to the one-sixteenth inch of wear as between the truck wheels on mogul engines and ten-wheel engines? Also comparative flange wear on driving-wheel tires of same engines?
5. What style of radius bar do you use for mogul engines? How do you figure its length, and could you furnish drawings for mogul truck for use at coming convention?
6. What proportion of weight do you think should be on drivers and pony truck?
7. What is the limit of weight, in your opinion, one driver should take?
8. What is the least weight you would recommend for a four-wheel truck?
9. On ten-wheel engines, would you recommend the blind tire forward or in the centre?
10. In case of the blind tire being in front, would you recommend a swing motion truck?

INDEX OF ANNUAL REPORTS.

A general index of the annual reports of this association, from the 1st to the 23d, inclusive, has been prepared and is ready for sending out. Members desiring to obtain the index will receive it, free of charge, on applying to the secretary.

New England Railroad Club.

At the regular meeting Wednesday evening, Jan. 14, President Richards occupied the chair, and announced as the subject for discussion for the next meeting, in February, "Painting and Varnishing of Railroad Rolling Stock," and stated that the committee in selecting this subject had voted that the master painters and the officers of the New England railroads be invited to attend.

The President announced as the subject for the present occasion, "What Constitutes a Defect in a Vertical Plane Coupler Sufficient to Condemn the Coupler?" The question to be opened by Mr. F. D. Adams, of the Boston & Albany. A report will be found in another column.

Northwestern Track and Bridge Association.

At the last meeting of the Northwestern Track and Bridge Association, held Jan. 16, the following officers were elected: President, John McMillan; Vice-Presidents, W. S. Darby, V. A. Amos; Treasurer, John Copeland; Secretary, D. W. Meeker.

Toronto Engineering Society.

The first meeting this term of the Engineering Society of the School of Practical Science was held last week at Toronto, with President Robinson in the chair. Mr. C. H. Mitchell read a paper on "Earthworks on Highways," going into details of construction, protection, etc., of cuttings and embankments. The discussion was postponed. Prof. Galbraith then gave a descriptive lecture on the new machine for testing the strength of iron and wood beams, etc., with which the laboratory is being supplied. It is of the same kind as the one in the United States government arsenal at Watertown, N. Y.

PERSONAL.

—Mr. S. S. Morris, Division Superintendent of the Gulf, Colorado and Santa Fé, has resigned.

—The death of Mr. Andrew McCallum, General Counsel of the Eastern Railroad Association, occurred Jan 14 last.

—Mr. C. F. Ward, Master Mechanic of the St. Paul & Duluth, has resigned to take a similar office with the Gulf, Colorado & Santa Fé road.

—The rumor that Mr. W. W. Fagan, General Superintendent of the Kansas City, Fort Scott & Memphis, had resigned, is not confirmed.

—Mr. William H. Grimes, Claim Agent of the New York Central in Western New York, has resigned, after a service with the company in that position, for over 40 years.

—Hon. Leland Stanford, Chairman of the Executive Committee of the Southern Pacific, has been re-elected United States Senator from California for a second term.

—Mr. William Kinyon, Master Car Builder of the Western & Atlantic has resigned. The position has been consolidated with that of Master Mechanic, and Mr. M. L. Collier will have charge of all motive power and rolling stock.

—Mr. L. S. Anderson, for the past five years Assistant Treasurer, Assistant Secretary and Assistant to the President of the Union Pacific road, has resigned, to take effect Feb. 1.

—Mr. Arthur P. Herbert, Mem. Am. Soc. C. E., late Chief Engineer of the Michoacan & Pacific, has been appointed Engineer and Superintendent of the Colima Division of the Mexican National Construction Co., with office at Colima, Mexico.

—Mr. A. G. Brodhead, Superintendent of the Beaver Meadow Division of the Lehigh Valley, died at Mauch Chunk, Pa., Jan. 18. He was 76 years old, and had been Superintendent of the Lehigh Valley for many years. He had held several elective political offices.

—Mr. C. E. Wurtele, formerly Superintendent of the Wyoming Division of the Union Pacific, but who resigned in 1889, has been reappointed to the position. Mr. F. Mertsheimer, who was appointed to the position last August, has been transferred to be Master Mechanic, a position which he had held for many years previously.

—Col. H. S. Haines, General Manager of the Plant System of railroad and steamboat lines for many years, and who is also well known through his connection with the work of the General Time Convention, of which he has been thrice elected President, has been elected Vice-President of the Plant System. He fills the vacancy on the Board caused by the death of Judge W. S. Chisholm.

ELECTIONS AND APPOINTMENTS.

Astoria & South Coast.—The directors of the company have recently elected the following officers: J. Q. A. Bowlby, President; Dr. Alfred Kinney and B. V. Anderson, Vice-Presidents; I. W. Case, Treasurer; Executive Committee, Dr. Alfred Kinney, Dr. Warren and E. L. Grimes.

Baltimore & Harrisburg.—At the annual meeting held Jan. 14, the following directors were elected: President, A. W. Eichelberger; Directors, J. M. Hood, W. S. Rayner, C. W. Slagle, David Wills, Reuben Young, W. H. Vickery, Jerome L. Boyer, L. P. Brockley, H. E. Young and R. M. Wirt.

Berlin Branch.—The following directors were elected at the recent annual meeting: President, A. W. Eichelberger; directors, Henry A. Young, R. N. Meisenhelder, Stephen Keefer, Daniel Eberly, Joseph Wolf, William S. Hildebrand, Jacob Resser, Michael Rebert and William G. Lease.

Berryville & Summit Point.—The incorporators of this West Virginia company are: Carroll Sprigg and Somerville P. Tuck, New York; W. M. Clements, R. O. Wilson, C. P. Wilson and A. P. Thompson, Summit Point, W. Va.; A. Moore, Jr., and R. P. Page, Berryville.

Bloomsburg & Sullivan.—At the annual meeting of the stockholders of the company, held at Bloomsburg, Pa., Jan. 13 the following board of directors was elected: C. R. Buckalew, Morton McMichael, J. Henry Kershow, Henry C. Gibson, Samuel Wigfall, Philadelphia; W. R. Tubbs, Wm. C. Neal, John K. Grotz and H. J. Conner, Bloomsburg, Pa. The directors elected the following officers: President, Hon. C. R. Buckalew; Vice-President, Samuel Wigfall; General Manager and Purchasing Agent, F. M. Leader; Treasurer, L. E. Waller, and Secretary, H. J. Conner.

Canadian Pacific.—J. H. Van Zile, Brownville Jct., Me., has been appointed Superintendent of Maine Line between Megantic, Que., and St. John, N. B., including McAdam. John Stewart, Woodstock, N. B., has been appointed Superintendent of all other sections comprising the Atlantic Division.

Chicago & Eastern Illinois.—D. Sams has been appointed General Southern Agent of the freight departments of this company and the Evansville & Terre Haute for the states of South Carolina, Alabama and Florida, with headquarters at Atlanta, Ga.

Colorado Midland.—B. K. Waterman, of St. Louis, has been appointed General Freight Agent of the company. Charles S. Lee will continue as General Passenger Agent of the road, with headquarters in Denver.

Concord & Montreal.—D. C. Prescott, Assistant General Freight Agent of the Boston & Maine, has been appointed General Freight Agent of this company.

Connecticut River.—Henry F. Sampson has been elected Superintendent of the road, with headquarters at Springfield, Mass., to succeed James Mulligan, recently elected President.

Danville & Western.—The Danville & New River Railroad has been reorganized under this name, with Col. J. Wilcox Brown, of Baltimore, President; J. C. Wrenshall, General Superintendent, and G. K. Griggs, Secretary and Treasurer.

Delaware.—The annual meeting was held at Dover, Del., Jan. 8, and the following directors were elected: Christian Febiger, President; John P. Green, I. N. DuBarry, George Gray, E. Tatnall Warner, Henry D. Welch, Joseph R. Whitaker, Manlove Hayes, Alexander Johnson, James J. Ross, Thomas Curry, J. Turpin Moore, Charles J. Harrington.

Delaware, Lackawanna & Western.—David Brown has been appointed Master Mechanic of the main line, to succeed Charles Graham, General Master Mechanic, resigned. Charles Graham, Jr., will be Master Mechanic of the Bloomsburg division.

Knoxville, Cumberland Gap & Louisville.—T. B. Taylor, late Auditor of the road, is now General Superintendent, succeeding Maj. James W. Wilson, Superintendent and Chief Engineer, who has resigned. Mr. Taylor's headquarters will be at Knoxville, Tenn.

Lehigh Valley.—At the annual meeting in Philadelphia, Jan. 20, the following directors and officers were elected: President, Elisha P. Wilbur; First Vice-President, Charles Hartshorne; Second Vice-President, Robert H. Sayre; Third Vice-President, John B. Garrett; Treasurer, William C. Alderson; Secretary, John R. Fanshawe; Assistant Secretary, Israel W. Morris; Directors, Charles Hartshorne, William L. Conyngham, Ario Pardee, William A. Ingham, Robert H. Sayre, James I. Blakeslee, John R. Fell, Robert A. Lamberton, John B. Garrett, Charles O. Skeer, Calvin Pardee, and George C. Thomas.

Maryland Central.—Directors were elected as follows at the annual meeting: William Gilmor, Fridge Murdock, Hugh B. Jones, F. H. B. Bullock, Samuel H. Crawford, Charles B. McConkey. The only change from the old board is that Fridge Murdock takes the place of A. C. Dravo. William Gilmor was re-elected President; Samuel Rea, Vice-President and Chief Engineer; Fridge Murdock, Treasurer; John K. Shinn, Secretary; C. F. Kerchner, Superintendent.

Mexican National.—The following new appointments in the traffic department have been announced: W. E. Thurber, General Western Agent, office at Rookery Building, Chicago, vice J. I. Kendall, resigned; W. B. Ryan, Commercial Agent, St. Louis, Mo., vice H. L. Parker, resigned; George W. Hibbard, Commercial Agent, Laredo, Tex., vice L. F. Cowan, resigned; G. T. Badeau, Commercial Agent, New Orleans, La.

Monterey & Mexican Gulf.—The following appointments have been recently announced, though some took effect some months ago: J. P. Flynn, Assistant General Superintendent, office at Monterey, Mex.; J. W. Roberts, Car Accountant, office at Monterey; L. F. Cowan, Assistant General Freight Agent, Monterey, and F. C. Barron, Master Mechanic, vice W. Nichols.

Montreal, Portland & Boston.—The annual meeting of the company was held in Montreal Jan. 21. The following directors were elected: George M. Hendry, B. B. Smalley, J. C. Hatton, A. H. Gilmour, A. P. Cross, W. C. Fisk and Francis McLennan. Hon. George W. Hendry was elected President; A. H. Gilmour, Vice-President, and W. C. Fisk, Secretary and Treasurer.

New Orleans & Northeastern.—D. Miller has been appointed Traffic Manager of the New Orleans & Northeastern, Alabama & Vicksburg and Vicksburg, Shreveport & Pacific roads, with headquarters at Cincinnati, O.

New York, Lake Erie & Western.—H. M. Steele has been appointed Assistant Engineer, to succeed J. W. Ferguson, resigned to become identified with Cofrode & Saylor, contractors, of Philadelphia.

Oregon Improvement Co.—W. H. Starbuck has been elected President of the company in pursuance of arrangements which have been effected for straightening out the finances of the company without resort to a formal reorganization.

Pennsboro, Auburn & Glenville.—The incorporators of this road, referred to last week, are: James E. Tyler, Baltimore, Md.; M. P. Kimball, W. Z. Harris, and J. M. Wilson, Pennsboro, W. Va., and M. H. Tarleton, Harrisville, W. Va.

Philadelphia & Reading.—At the recent annual meeting the stockholders voted that the resolution adopted at the annual meeting, held Jan. 9, 1890, creating the offices of first register, second register and assistant secretary, be rescinded, and that the Board of Managers be authorized to empower such officers of the company as they may deem proper to sign and attest any general mortgage bonds, first preference income mortgage bonds, and third preference income mortgage bonds as the company may have power to issue under the several mortgages dated Jan. 3, 1888.

Philadelphia & Reading Terminal.—Austin Corbin has resigned the Presidency of the company, and A. A. McLeod, President of the Philadelphia & Reading Railroad, has been elected to the position.

Philadelphia, Wilmington & Baltimore.—At the annual meeting held at Wilmington, Del., Jan. 12, the following officers and directors were elected: G. B. Roberts, President; Frank Thompson, Vice-President; J. C. Sims Jr., Secretary; R. W. Smith, Treasurer; B. B. Comegys G. B. Roberts, Frank Thompson, J. N. Du Barry, William Sellers, J. P. Green, Wistar Morris, Henry D. Welsh, Philadelphia; Christian Febiger, E. Tatnall Warner, Wilmington; Benjamin F. Newcomber, Skepworth Wilmer, German H. Hunt, Baltimore; Jacob Tome, Port Deposit, and Edward Lloyd, Tunis Mills, Md.

Plant Investment Co.—The Board of Directors have elected H. S. Haines a member of the Board and Vice-President of the company, in place of W. S. Chisholm, deceased. The following appointments are announced: M. F. Plant, Assistant Manager Plant Steamship Line, and D. F. Jack, General Auditor, Plant System.

Rumford Falls & Buckfield.—The annual meeting of the road was held Jan. 13, and the stockholders chose the following directors: William L. Putnam, Chas. R. Milliken, Wm. H. Moulton, R. C. Bradford, Chas. S. Fobes, Portland, Me.; Geo. C. Wing, Auburn; Geo. D. Bisbee, Buckfield, Me.

St. John Bridge & Railway Co.—At the annual meeting of this New Brunswick company, held last week, the following board of directors was elected: Dr. F. E. Barker, W. H. Thorne, C. W. Weldon, Thos. Williams Payson Tucker, Arthur Sewell and J. Murray Kay.

St. Louis, Arkansas & Texas.—Col. J. W. Fox, division superintendent, having resigned to go with the Queen & Crescent road, has been succeeded by D. Nattage, who has been agent for some time, and whose headquarters will be at Jonesboro, Ark.

St. Louis & Southwestern.—The following are the directors of this company, the reorganized St. Louis, Arkansas & Texas: S. W. Fordyce, J. W. Phillips, Robert Moore, A. L. Wolff, W. E. Doddridge, E. G. Merriam, W. A. Robinson, St. Louis, Victor Morawitz, New York City, and W. S. Pierce, Brooklyn.

St. Paul & Duluth.—Charles F. Wald having resigned to accept a position with another company, George D. Brooke will succeed Mr. Wald as Master Mechanic.

Union Pacific.—The following appointments have been made on the Nebraska division: Frank H. Neeshan, Assistant Superintendent, with headquarters at Omaha; W. S. Park, Assistant Superintendent, with headquarters at North Platte; R. R. Sutherland, Assistant Superintendent, with headquarters at Lincoln, Neb.

Western & Atlantic.—The motive and car departments have been consolidated. M. L. Collier, formerly Master Mechanic of the road, will hereafter have entire control of all the rolling stock, relieving William Kinyon, Master Car Builder.

Wrightsville & Tennille.—The following directors were elected at the annual meeting: E. P. Alexander, C. R. Pringle, J. S. Wood, O. H. Rogers, G. W. Perkins, Charles H. Hicks, R. L. Warthen, A. F. Daley, W. B. Thomas. J. S. Wood, of Savannah, was elected President, vice W. B. Thomas; and G. W. Perkins, of Tennille, Superintendent, vice W. B. Thomas, who for several years has held both offices.

Zanesville & Ohio River.—At the annual meeting of the stockholders the following directors were elected: C. M. Wicker, H. B. Hollins, August Belmont, Jr., R. N. Young, E. E. Dennison, Henry C. Scott, E. M. Stanbery, T. W. Moore, A. W. Train, James Buckingham, John Hoge, M. Churchill, and W. A. Graham. C. M. Wicker was re-elected President, and J. Hope Sutor Secretary and Treasurer.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Akron & Chicago Junction.—The grading of the road, from Chicago Junction eastward to Warwick, Ohio, 60 miles, has been completed and 30 miles of track has been laid. It is expected to finish the tracklaying and ballasting to Akron, nine miles further, this month.

Boston & Maine.—A bill was introduced into the Maine Legislature last week authorizing the company to increase its capital stock by $5,000,000, the proceeds to be devoted to providing additional property and equipment for the road, to construct additional railroads and the reduction of debts. The officers of the road say that they will soon have to double-track 35 additional miles of the western division, at a cost of $700,000, and about 64 miles of the eastern division, at a cost of $1,280,000.

Canadian Roads.—Application is being made to the Dominion Parliament for power to construct a road from a point in the township of Wright, Ottawa County, on the Ottawa & Gatineau Valley road, to the village of Renfrew, Ont., with power to cross the Ottawa River by bridging the same at the village of Portage du Fort.

Concord & Montreal.—A bill has been drawn by the company's counsel, and will be introduced at the present session of the New Hampshire State legislature, allowing the company to issue $3,000,000 new stock. The stock is to be issued for the extension of the Whitefield & Jefferson road to Berlin, N. H., and beyond; for providing terminal facilities at Nashua; for track and extension of coal facilities at Portsmouth, including an extension of the wharves; for changing the track at Groveton Junction; for securing better facilities for connection with the Grand Trunk line, and for providing additional accommodations and facilities at Nashua, Manchester, Laconia, Lake Village and other places on the lines of the system. The company is contemplating extensive improvements along its line, especially at Manchester and Nashua. Under this bill no new stock can be issued, except for the purpose of providing money for improvements.

Cynthiana & Western.—The company has been organized in Kentucky to build a road from Maysville, on the Ohio River, southwest through Cynthiana to Georgetown, Ky., a distance of about 55 miles.

Deming, Sierra Madre & Pacific.—The concession for this road and also that of the Chihuahua, Sonora & Sinaloa, the Mexican line, has been transferred by Luis Huller, of the City of Mexico, to John W. Young, of Salt Lake City, who proposes to complete a large part of the line this year. The former owners graded the road from Deming, N. Mex., south to the Mexican line, and track was laid on part of this distance when the contractors failed. The work already done will be repaired this year and the road graded and track laid as far as Palomas, Mex. The Mexican line will pass through Ascencion, Diaz, Carrallitos, Casas Grandes, Galeana El Valle, Cruces, Mamiquipa, Santa Ana, Manzana, Santo Tomas and Guerrero; at this point one branch will extend east to Chihuahua the other west to Guaymas. The line through Mexico is now being located by Ladislao Weber, of Deming. The New York office of J. W. Young is at 57 Broadway.

Duluth & Winnipeg.—The engineers have surveyed a line six miles long to a connection with the Northern Pacific, and it is proposed to secure an entrance to Duluth, Minn., and West Superior, Wis., by a trackage agreement over that road. A survey has also been made from Cloquet, the present eastern terminus, to Duluth, but, though generally it has a good location, for part of the distance the work will be heavy and expensive. The end of the track is now about 11 miles beyond Grand Rapids, Minn., and 81 miles northwest of Cloquet. At the terminus the construction company has track material for over 25 miles of road. The company proposes to build a branch a distance of eight miles to mines recently discovered of iron ore in section 36, township 55, range 26, Minnesota.

Fort Worth & Rio Grande.—The surveyors are now making the location for the extension from Comanche southwest to Brownwood, Tex. The earthwork will be light and it is expected that the grading will begin as soon as the engineers finish locating.

Genesis & Obed River.—At an election held in Spring City, Cumberland County, Tenn., last week, the town voted nearly unanimously to grant $20,000 in bonds to this company. The road is being built by the Phillipsburg Land Co., of Crossville, Tenn., which is largely owned by Albany, N. Y., parties. There is an office at 463 Broadway, Albany. The company will establish a new town on the route of the road to be known as Phillipsburg. The road has been graded for five miles from Crossville. Grading will commence in March at Spring City. The survey is being made by M. C. Massie, Chief Engineer.

Gurley & Paint Rock Valley.—The company will apply to the Alabama state legislature for an amendment to its charter to authorize the construction of a road from near Bell Factory to southeast Attalla or Gadsden, and thence to the state line between Georgia and Alabama.

Houston, Central Arkansas & Northern.—A mortgage issue at the rate of $20,000 per mile has been filed for record in Arkansas. It is on the 150 miles of road in that state from Marianna, Lee County, connecting with the St. Louis, Iron Mountain & Southern road, and through the counties of Lee, Monroe, Phillips, Desha, Chicot, Drew and Ashley, to a point on the boundary line of Louisiana and Arkansas, 150 miles.

Kansas & Missouri.—The charter was filed in Missouri last week. The company proposes to build a road from Booneville, Mo., to Topeka, passing through Cooper, Pettis, Johnson and Jackson counties in Missouri and Otoe, Leavenworth, Jefferson and a part of Shawnee counties in Kansas. The capital stock of the road is $5,000,000. The directors for the first year are: J. R. Taylor, H. W. McCreary, S. H. Pettison and John Keller, Kansas City, Mo.; W. R. Taylor and W. Wiggins, of Wichita, Kan., and H. W. Wilkins, of Kansas City, Kan.

Kettle Falls & Columbia Valley.—Articles of incorporation were filed in Washington last week by this company. The road is to extend through the Columbia Valley to the mouth of the Spokane River, thence through the Big Bend country to Wallula Junction, where it will connect with the Union Pacific and Northern Pacific roads, and thence to some point on the Columbia near that place. The capital stock is $2,500,000. The officers are as follows: Henry D. Bushnell, President; William H. Reid, of Rochester, Vice-President and Treasurer; Henry D. Quinby, Secretary. A large amount of preliminary work has already been done and the final surveys will be pushed as rapidly as possible. The company also proposes establishing lines of steamers on both the Upper and Lower Columbia.

Laurel & Roaring Point.—The Delaware Legislature has been applied to for a charter for a road of this name, which it is proposed to build across the eastern peninsula of Maryland from Laurel to Chesapeake Bay.

Lehigh Valley.—The new westbound track constructed at Bethlehem, Pa., around the Bethlehem Iron Works, two miles long, is now completed and in use.

Midland (Indiana).—The special election in Brazil Township, Ind., last week on the question of subsidizing the company, resulted in favor of the subsidy by 250 majority on a two-thirds vote. The subsidy will aggregate $23,000. The company owns the right of way to Sand Creek, in Parke County, 23 miles. A force of men are at work between Carbon and Brazil.

Minneapolis, St. Paul & Sault Ste. Marie.—It is reported that plans are now being completed for the building of an extension of this line next season from the present terminus in North Dakota to Regina, N. W. T., where it will connect with the Canadian Pacific.

Missouri Pacific.—It is reported that the contract has been let and work commenced on the connection of that part of the St. Louis, Iron Mountain & Southern between Camden and Warren, Ark., 40 miles, which remains uncompleted. Work on this line has begun at various times, but never finished.

Mohawk & St. Lawrence.—Maps and profiles of the first sections of this road, the St. Lawrence River extension of the New York Central, have been filed with the County Clerk and with the New York State officers. The survey has been made for a considerable distance from Utica north through Oneida, Lewis and Jefferson counties toward the St. Lawrence River, about 175 miles. The above is the name under which the extension has been incorporated.

New Roads.—The Board of Trade of Little Falls, N. Y., is endeavoring to complete a subscription of $75,000 started for a railroad from Little Falls north to Dolgeville, N. Y. Nearly the entire sum has been already subscribed.

A company has been formed recently to build a line from East St. Louis south along the Mississippi River to Chester, and thence southeast to Grand Tower, Cairo and Paducah. The incorporators are: G. F. Evans, K. L. Lowell, Louisville, Ky., and Allen Livingston, St. Louis.

Northern Michigan.—It is stated that the franchise for this road from Houghton, Mich., to Watersmeet, Wis., a distance of 70 miles, will be sold to the Milwaukee & Northern road. It is proposed to build the line next summer.

Northern Pacific.—The extension of this line to Montesano, Wash., has been completed, and trains are running into that town. The distance west from Centralia is 42 miles. The grade of the new line from Montesano to Occsta has been nearly completed and is finished to Aberdeen. Work was stopped last week by rainy weather, and probably no attempt will be made to finish the Ocosta line before next summer, though trains will be put on to Aberdeen by Feb. 15.

The branch of the Northern Pacific & Montana between Rivulet and St. Regis will be operated as part of the Rocky Mountain division. The stations and distances from De Smet are as follows: Rivulet, 42; Quartz, 45; Iron Mountain, 58; Spring Gulch, 63; St. Regis, 74 miles.

Oil Valley.—Three of the five miles of this road have been completed. It is being built in McKean County, Pa., from Watsonville to Wilbur, connecting with the Western New York & Pennsylvania. The line will not be open for traffic before May 1. W. A. Depue, of Odessa, N. Y., is the contractor for grading and tracklaying. He will resume work in the spring. On a short section the maximum grades will reach 100 ft. per mile. Charles A. Weed, Binghamton, N. Y., is President.

Paducah, Tennessee & Alabama.—The track from the Kentucky state line, to which point it was laid Jan. 1, is now within a short distance of Paris, Tenn., 15 miles south of the state line. The work will be discontinued at Paris for the winter, and it is not known whether any work will be done beyond that point this year. Most of the contractors have secured work on the Mississippi levees.

Peninsular.—The survey from Allyn to deep water on Hood's Canal in Washington has been recently finished by Mr. Beach, of Tacoma. The terminus on the canal is at Morans.

Philadelphia & Erie.—The company has placed upon record, at Erie, Pa., a resolution to increase the bonded indebtedness of the road to the extent of $200,000. The money is to be used principally for extending the second track, which is partially built from Williamsport to Erie.

Pittsburgh, Shenango & Lake Erie.—The grading is all finished on the extension from Osgood north to Girard Junction, excepting about two and one-half miles. The track has been laid for 20 miles north of Osgood, and this year three miles has been laid south from Girard, where a connection is made with the New York, Chicago & St. Louis. This leaves 23 miles of the extension still uncompleted. Dick & Huidekoper, of Meadville, Pa., have the contract for building and equipping the line. The work is mostly light except across the Elk Creek Valley. The maximum grade going north is 26 ft., and going south 53 ft. per mile. Ten degrees is the maximum curvature. One iron bridge, 540 ft. long, and 80 ft. high, will be built across Elk Creek by the Penn Bridge Co., of Beaver Falls, Pa. There are no other important bridge or trestles. The towns on the extension north of Osgood are: Adamsville, Hartstown, Shermansville, Dixonburg, Conneautville, Springboro, Shadeland, Keepville, Albion, Cranesville, Lockport, Girard, and Girard Junction. In the spring the construction of a branch from a point one mile north of Cranesville to Conneaut Harbor, 12 miles, will be begun.

Richmond, Fredericksburg & Potomac.—The Belt Line, or James River Branch of the road, connecting with the Atlantic Coast Line beyond Manchester, Va., will be opened Feb. 1.

St. Lawrence & Northwestern.—It is reported that this company has been successful in negotiations in England, for the money necessary for the construction of the road and will commence operations in the spring. The line will start from the St. Lawrence at Three Rivers and extend into the interior in a northwesterly direction to the river Matawan, a distance of about 70 miles.

Seattle, Lake Shore & Eastern.—The company is laying track on the six miles between the south and north forks of the Nooksack River. Between two and a half and three miles has been laid, beginning at the south fork, and the work will be pushed as fast as the weather will permit.

South Carolina Roads.—Bills providing charters for the following companies, not previously mentioned, have passed the legislature and become laws: Savannah, Seneca & Western; Salem; West End; Anderson & Port Royal; South Carolina, Seaboard & Western; Pickens; Highland, and Spartanburg, Glendale & Clifton railroads.

Southern Central.—A corps of engineers has commenced the survey between Harrisburg and Sunbury. The line will run along the Susquehanna River through Snyder and Perry counties, Pa., and will cross the Susquehanna River at the Dauphin county shore at Clark's Ferry. From the latter point it will follow the river to Dauphin and Harrisburg over the Schuylkill & Susquehanna.

Stone Mountain.—This road will be put in operation this week. It is a little over five miles long, and has been built in the last six months. It extends from Longmont to a connection at Tower Hill, Col., with the Chicago, Burlington & Missouri River road. It passes around Beek Hill and reaches many sandstone quarries. It cost about $55,000 to build. C. E. Day, of Longmont, Col., is President, and J. L. Grant is General Manager.

Trenton Cut-off.—The tracklaying on the road is being pushed rapidly. The rails are now laid from Morrisville, Pa., to the point where the road crosses the Bound Brook line, about a mile and a half east of Langhorne. The iron work for the bridges is being delivered all along the line between Morrisville and the Schuylkill River. The large bridges on the line of solid masonry are now all about finished, ready for tracklaying. Considerable grading has been done for the location of the various stations on the route. A feature of the line is the absence of all grade crossings. Tracklaying is also proceeding westward from Norristown.

Victoria, Saanich & New Westminster.—This company is applying to the Dominion Parliament for an extension of time for constructing its road and also for power to reduce the capital stock of the company and to build branches on the south side of the Fraser River, to connect Liverpool and New Westminster, B. C., with its road at or near Canoe Pass and Point Roberts Mole.

Waco, Lampasas & Llano.—A committee of business men is securing subscriptions for a proposed subsidy of $100,000, which this company asks to build to San Antonio. It proposes to build from that point to Llano, if $80,000 is voted to it by Gillespie County, and Llano, Tex., $40,000 by each. About 400 men are grading between Lampasas and the Colorado River, 18 miles, and the locating survey is being made west of the river to Llano.

GENERAL RAILROAD NEWS.

Baltimore & Ohio.—The earnings and expenses for December, 1890, compared with December, 1889 (December, 1890, approximated), are as follows: Entire system east and west of the Ohio River: Earnings 1889, $2,130,993, and 1890, $2,022,027, a decrease of $108,966; expenses, 1889, $1,409,751, and 1890, $1,407,172, a decrease of $2,579; net, 1889, $721,242, and 1890, $614,855, a decrease of $106,367. Earnings and expenses for the three months of the fiscal year 1890-'91, compared with the same months of the previous fiscal year (December, 1890, approximated): Earnings, 1889, $6,342,924, and 1890, $6,259,487, a decrease of $83,437; expenses, 1889, $4,057,588, and 1890, $4,269,217, an increase of $210,629; net, 1889, $2,285,336, and 1890, $1,990,270, a decrease of $295,026.

Blue Ridge & Atlantic.—The road has been placed in the hands of Patrick Colhoun, Counsel of the Richmond & West Point Terminal, as Receiver. The line has been unprofitable for some time and it will probably come under the control of New York parties, who are heavy creditors. It is 21 miles long, extending from Cornelia to Tallulah Falls, Ga. The rails are of iron and the

olling stock has been leased from the Richmond & Danville.

Atchison, Topeka & Santa Fe.—The gross earnings, operating expenses (exclusive of taxes and rentals), and net earnings of the road and its auxiliary lines for the month of November, were as below :

	Gross earn.	Oper. expen.	Net earn.	Oper. mileage.
Roads owned and controlled	$2,909,330	$2,127,870	$781,460	6,527
Roads jointly owned, Atchison Co.'s one-half	163,550	158,920	4,630	582
Total	$3,072,880	$2,286,790	$786,090	7,109
St. Louis & San Francisco:				
Roads owned and controlled	$627,191	$336,303	$290,888	1,329
Roads jointly owned with Atchison, 'Frisco Co.'s one half	160,511	153,388	7,123	526
Total 'Frisco system	$787,702	$489,691	$298,011	1,855
Aggregate, both systems	$3,860,582	$2,776,481	$1,084,101	8,965

Comparative statement, all lines.

	Gross earn.	Net earn.	Per Mile Gross earn.	Per Mile Net earn.	Mileage.
Atchison system :					
November, 1890	$3,072,880	$786,090	$432.23	$110.57	7,109
November, 1889	2,741,978	1,069,573	385.56	150.39	7,112
Incr. or dec.	I. 330,502	D. 283,483	I. 4.67	D. 39.82	D. 2.34
'Frisco system:					
November, 1890	$787,702	$298,011	$424.55	$160.62	1,855
November, 1889	696,889	307,858	375.61	165.93	1,855
Inc. or dec.	I. 90,813	D. 9,847	I. 48.94	D. 5.31	
Aggregated general system:					
November, 1890	$3,860,582	$1,084,101	$430.64	$120.93	8,965
November, 1889	3,438,868	1,377,431	383 59	153.61	8,967
Inc. or dec	I. 421,714	D. 293,330	I. 47.14	D. 32.68	D. 2.34

Canadian Pacific.—This company is applying to Parliament for power to increase the amount of consolidated debenture stock for the purpose of paying indebtedness incurred in constructing its Souris branch, and the Columbia & Kootenay and Manitoba Southwestern lines, as well as obligations which it may undertake in respect of the Lake Temiscamingue Colonization line and a road 27 miles in length from Saskatoon to the waters of the North Saskatchewan River.

Covington & Macon.—The Central of Georgia has made a proposition to the Reorganization Committee of this road to least it for 99 years, and guarantee a new loan at four per cent. for 30 years to redeem the present six per cent. bonds and the overdue coupons.

Danville & Western.—The Danville & New River has been reorganized under the above name. The road was sold under foreclosure last August, and purchased by J. Wilcox Brown, of Baltimore, for the majority of bondholders. The bonds outstanding amount to $700,000. The reorganized road will issue stock to the amount of $15,000 on each mile operated, which will be turned over to the Richmond & Danville, and on this basis new bonds will be issued, the principal and interest to be guaranteed by the road. These bonds will be apportioned to the holders of the securities of the old road.

Dayton, Fort Wayne & Chicago.—The Cincinnati, Hamilton & Dayton purchased this road and its Delphos and Ironton divisions at the foreclosure sale in Dayton, O., this week. The price was $1,453,384. The company operates 250 miles of road from Delphos to Ironton, but about 40 miles is leased.

Illinois Central.—The net income from traffic for the six months ending Dec. 31, 1890 and 1889 (December, 1890, estimated) was as follows:

	1890.	1889.	Inc. or dec.
Miles operated	2,275	2,275	
Gross receipts	$7,982,149	$7,768,212	I. $213,937
Oper. expenses and taxes	5,274,549	4,504,577	I. 769,972
Net earnings	$2,707,600	$3,263,635	D. $556,035

The Dubuque & Sioux City Co. reports its gross and net income for the six months to Dec. 31 as follows:

	D. & S. C. 1890.	D. & S. C. 1889.	Ced. F. & M. 1890.	Ced. F. & M. 1889.
Miles operated	524	524	76	76
Gross receipts	$1,204,851	$1,037,405	$54,747	$50,529
Op. exp. and taxes	864,773	714,889	68,762	82,493
Net earnings	$340,078	$322,516	Df. $14,015	Df. $31,964

	Both roads. 1890.	1889.	Inc.
Miles operated	600	600	
Gross receipts	$1,259,598	$1,087,934	$171,664
Oper. expenses and taxes	933,535	797,382	136,153
Net earnings	$326,063	$290,552	$35,511

Kansas & Colorado Pacific.—This month the following lines of the Missouri Pacific were consolidated under the above title: Council Grove, Osage City & Ottawa; Topeka, Salina & Western; Missouri Pacific (line in Kansas), Kansas & Colorado; Denver, Memphis & Atlantic; Council Grove, Smoky Valley & Western; Kansas, Nebraska & Dakota; Salina, Sterling & El Paso; Wichita & Colorado; Verdigris Valley; Independence & Western; Grouse Creek and Interstate.

Lake Erie, Alliance & Southern.—One of the divisions of this road was sold at Canton, O., Jan. 16, by the United States Court. The action was in the suit brought by the first-mortgage bondholders, and the line was bought in for them by Theodore F. Hicks, of New York, for $100,000.

Lehigh Valley.—The annual report published this week gives the following figures: Transportation earnings: From coal, $8,093,360; from miscellaneous freight, $5,218,204; from passengers, $1,954,048; from express and mail, $157,245; income from investments and other sources, $1,704,112; total, $17,432,007. Cost of operation, including rental of leased lines, $11,951,771; net revenue, $5,480,235. Against which there has been charged general expenses, interest on floating debt, taxes, loss on Morris Canal, etc., $694,258; interest on bonds (including interest on guaranteed bonds and stock), $2,651,120; dividends on preferred and common stock, $2,027,370; total, $5,372,748; leaving $107,487 to be added to the credit of the profit and loss account. The anthracite tonnage of the road was 8,126,629 tons, a decrease of 196,965 tons. The total tonnage was 13,450,284 tons, an increase of 646,533 tons. The report refers to the creation of the mortgage for $15,000,000 on the entire property of the company to secure the issue of bonds to that amount, bearing interest at 4½ per cent. per annum, and falling due July 1, 1940. These bonds have been guaranteed by the parent company, and $6,300,000 of them have been sold. The $600,000 7 per cent. bonds of the Ithaca & Athens Railroad were all redeemed on July 1, 1890, leaving the above $15,000,000 as the only mortgage obligation existing against the company. The sale of $3,000,000 of the consolidated mortgage bonds with interest thereon reduced from 6 per cent. to 4½ per cent. per annum, was also authorized and has recently been accomplished.

Marietta & North Georgia.—The hearing of the application of the Central Trust Co. for a receiver for the road came up in the United States Circuit Court, at Atlanta, Ga., Jan. 1. J. B. Glover, Superintendent of the road, was appointed temporary receiver. The order restrains him from paying any of the road's debts save the necessary current expenses. It is claimed that the intention of the attorneys for the stock and bond holders is to resist the application for a permanent receiver.

Missouri Pacific.—The traffic agreement between this company and the Richmond & Danville, governing the interchange of business between the lines of the two systems reaching the Mississippi River, is announced as being effective Feb. 1.

New York, Ontario & Western.—At the annual meeting of the stockholders this week it was decided to rearrange the capital stock. At present there is $58,000,000 of common stock and only $2,000,000 of preferred stock. The directors will prepare a plan for exchanging a limited amount of the common stock for new preferred stock, on terms to be decided by vote of the stockholders. The report for the year ending June 30, 1890, gives the following figures : Gross receipts, $1,963,756; operating expenses and taxes, $1,593,999; net earnings, $369,756; interest and other charges, $223,314; surplus, $146,441. The gross earnings show an increase of about $220,000 over 1889. The surplus in 1889 was $62,645, the increase last year $84,000. A statement for the six months ending Dec. 31 included the Scranton coal extension.

Petersburg.—The North Carolina House of Representatives has before it, favorably reported, a bill to renew in perpetuity the charter of the company, with all the provisions of its previous charter and amendments thereto except the clause exempting the road from taxation. It is specially provided that the road, franchises, stock, and all property shall be subject to taxation to the same extent as any other corporation chartered by the state.

Syracuse & Baldwinsville.—The bondholders bid in this road for $150,000 when it was offered for sale at Syracuse, N. Y., recently in foreclosure proceedings. The road was built in 1886 from Baldwinsville to Amboy, N. J., six miles.

Toledo & Ohio Central.—The stockholders of the company will hold a special meeting in New York on Feb. 18 for the purpose of taking action upon a proposition to increase the common capital stock in the amount of $3,000,000; also to vote upon the guarantee of the bonds of the Kanawha & Michigan.

Tonawanda Valley & Cuba.—The foreclosure sale of the Metropolitan Trust Co., of New York, against this road was held at Cuba, N. Y., Jan. 19. The entire property was purchased by Henry O. Oakley, William Jay, Sumner R Stone and Richard B. Ferris, of New York, as committee for certain bondholders. The price was $33,500. The road is narrow gauge, 59 miles long, from Attica to Cuba, N. Y.

Union Pacific.—The statement of the earnings of the system for November and the 11 months shows an increase of $249,871 in gross and a loss of $188,234 in net earnings, as compared with last week. The figures for some of the divisions and for the system were as follow :

OREGON SHORT LINE & UTAH NORTHERN.

November:	1890.	1889.	Inc. or dec.
Mileage	1,399	1,399	
Gross earn	$671,698	$586,525	I. $85,173
Oper. expen	470,761	337,335	I. 133,426
Net earn	$200,937	$249,190	D. $48,253
Since Jan. 1:			
Gross earn	$6,881,911	$5,958,939	I. $922,972
Oper. expen	4,535,359	3,290,845	I. 1,244,514
Net earn	$2,346,552	$2,668,094	I. $321,542

UNION PACIFIC, DENVER & GULF.

November:			Inc.
Mileage	1,386	1,385	1
Gross earn	$502,774	$420,093	$82,181
Oper. expen	392,441	319,198	73,243
Net earn	$110,333	$100,895	$19,438
Since Jan. 1:			
Gross earn	$5,278,206	$4,163,506	$1,114,700
Oper. expen	3,657,210	3,099,677	557,533
Net earn	$1,620,996	$1,063,829	$557,167

TOTAL UNION PACIFIC SYSTEM.

November:			
Mileage	8,024	7.936	I. 88
Gross earn	$4,102,653	$3,852,782	I. $249,871
Oper. exp	2,924,641	2,486,476	I. 438,165
Net earn	$1,178,012	$1,966,306	D. $188,294
Since Jan. 1:			
Gross earn	$41,242,259	$37,227,859	I. $4,014,400
Oper. exp	27,854,549	22,968,051	I. 4,886,498
Net earn	$13,387,710	$14,259,808	D. $872,098

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Jan. 21, 1891.

A committee of traffic officials of lines members of the new Western Traffic Association met Jan. 16 and 17, in compliance with instructions of the New York meeting, for the purpose of assigning to the different divisions of the association traffic not included in existing associations. After two days' consideration of the problem they decided to refer the whole matter to the Board of Commissioners for determination. Until the committee appointed for the purpose of securing the co-operation of the remaining roads and of such outside lines as may wish to join the association has made its report, there will be no change in the present make-up of the existing associations. When all the lines have decided as to their attitude in regard to joining the new association, and the committee has reported, the present associations may be disbanded by withdrawal of the companies. The Board of Commissioners will hold a meeting some time next week to arrange the details of the new organization, and consider such matters as have already been referred to them. The general opinion here is that the machinery of the new association is adequate, provided the members carry it into effect in the spirit and intent of the agreement; otherwise, the association will prove no more useful than the existing ones.

The Western Freight Association has agreed to continue the present practice of permitting reconsignment of coal at interior points. No change will be made for the present in the rate on flour from St. Paul and Minneapolis to New Orleans and other Mississippi River points

The Central Traffic Association has agreed that through rates from Central Traffic Association territory to northwestern points via Chicago be based, whenever possible, upon the sum of the locals via Chicago, the rates, Chicago to St. Paul and common points, to be on the 60-cent scale. A resolution was adopted that the practice of forwarding car-load shipments for distribution by agents at destination to different consignees should cease.

It is announced that the Omaha bridge difficulty between the St. Paul, Rock Island and Union Pacific is to be settled through the courts, and that its determination will have no effect on the new association. The Union Pacific has sent the Rock Island formal notice that it has backed out of the agreement with that company, and released the latter from any contracts under it with the Union Pacific. President Cable of the Rock Island is quoted as saying that, in case the decision of the courts is adverse to his company, they will at once build their own bridge.

Beginning Jan. 15, the lines between Chicago and Council Bluffs and Omaha ceased selling unlimited tickets, and all tickets are hereafter to be limited to use within 24 hours of date of sale. This action was taken to prevent scalpers using the unlimited tickets to scalp intermediate points.

The Chicago, St. Paul & Kansas City will open its extension to Kansas City Feb. 1.

The Atchison has given notice to the other lines that it has reason to believe its competitors are not keeping the pass agreement, and that it will, therefore, use its own discretion in giving passes. The other roads are endeavoring to get the Atchison to reconsider its decision.

Traffic Notes.

The advanced westbound second class passenger fares from Boston via the Fitchburg are on the basis of $15 to Chicago. The Boston & Maine has also made an advance, but only to $13.75.

The Southwestern Railway & Steamship Association has advanced freight rates from New Orleans, Galveston and Houston to Colorado and Utah points, to accord with the proposed advance in rates from Chicago and St. Louis to these points. The advance is 5 cents on first class and 1½ cents on the lowest class. The reduction will go into effect Feb. 7.

The announcement that the lines taking freight from the Atlantic seaboard to St. Paul via the Sau't Ste. Marie had agreed to advance freight rates from $1.05 to $1.20 per 100 lbs. (first class) proves to have been premature. The Central Vermont objects and claims that it was not represented at the meeting. It is alleged that the Soo road is the real objector.

It appears from a press dispatch that 1,000-mile tickets have been put in use on all the lines in the Chicago and Ohio River Traffic Association to be sold at the rate of two cents a mile, the Association thus meeting the rate adopted by the Pennsylvania. The roads interested have given very positive instructions to their conductors regarding the use and misuse of these tickets, and seem to be very much in earnest in taking precautions to prevent their manipulation by scalpers.

The wheat shippers of the Pacific Northwest have complained greatly of the lack of cars to move their product to the seaboard during the past season, and the roads have been unable to carry all the wheat that was offered, but the shippers now have a chance to see that the railroads are not the cause of all their trouble, as it has lately become necessary to hold many cars at Tacoma, loaded with wheat, because the elevators are full; and the glut here is owing to non-arrival of vessels.

The item printed a week ago to the effect that there is a good deal of demoralization in passenger rates from Buffalo eastward seems to have had considerable basis of truth, though the number of tickets in the hands of scalpers, which, it is said, they can sell for a dollar or two less than the tariff, was, doubtless, much overstated. The Buffalo *Courier*, which is generally well-informed on railroad matters, says that sharp practice, failure to keep agreements, and various connivances with scalpers have been very prevalent among passenger agents there for some time.

Anthracite Coal Production.

The output of anthracite coal during 1890 by regions as compared with last year is as follows: Wyoming, 18,657,695 tons; increase, 9,769. Lehigh, 6,329,658; increase, 44,237. Schuylkill, 10,867,822; increase, 393,458. Total, 35,855,175; increase, 447,464. At the close of the year the stock at tidewater was reduced to 535,652 tons. There is, however, in the interior an unknown quantity of coal, estimated to be fully as great as that at tidewater. Of the increase reported, 329,000 was in December.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Jan. 17, amounted to 74,810 tons, against 92,597 tons during the preceding week, a decrease of 17,787 tons, and against 128,096 tons during the corresponding week of 1890, a decrease of 53,286 tons The proportions carried by each road were :

	Wk. to Jan 17. Tons.	Wk. to Jan 17. P. c.	Wk. to Jan. 10. Tons.	Wk. to Jan. 10. P. c.
Michigan Central	9,310	12.5	12,446	13.4
Wabash	5,046	6.8	5,764	6.2
Lake Shore & Michigan South.	13,287	17.7	16,406	17.7
Pitts., Ft. Wayne & Chicago	8,105	10.9	8,580	9.3
Chicago, St. Louis & Pitts	7,906	10.5	9,016	9.7
Baltimore & Ohio	5,821	7.7	7,090	7.5
Chicago & Grand Trunk	13 116	17.4	15,252	16.5
New York, Chic. & St. Louis	4,986	6.7	10,911	11.8
Chicago & Erie	7,233	9.7	7,132	7.7
Total	74,810	100.0	92,597	100.0

Of the above shipments 6,217 tons were flour, 35,114 tons grain, 3,503 tons millstuffs, 6,172 tons cured meats, 2,975 tons lard, 8,108 tons dressed beef, 1,016 tons butter, 2,329 tons hides, 181 tons wool and 4,450 tons lumber. The three Vanderbilt lines together carried 36.7 per cent., while the two Pennsylvania lines carried but 21.5 per cent.